

# A MONOGRAPH OF THE AUSTRALIAN SPONGES.

(CONTINUED.)

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PART III.

[PLATES LIX. TO LXVII.]

## PRELIMINARY DESCRIPTION AND CLASSIFICATION OF THE AUSTRALIAN CALCISPONGIÆ.

### CLASSIS SPONGIÆ.

CeLenterata, with a GASTROVASCULAR SYSTEM WHICH OPENS ON THE SURFACE WITH MANY SMALL AND MOSTLY ONE OR A FEW LARGE APERTURES. NOURISHING MATERIAL FLOWS IN THROUGH THE SMALL PORES, THE LARGE PORES OR OSCULAE ARE CLOACÆ. FRILLED CILIATED CELLS ARE GENERALLY AMASSED IN CERTAIN PORTIONS OF THE CANAL SYSTEM. ALL THE EPITHELIA CONSIST OF SINGLE LAYERS OF CELLS, THE MESODERM IS HIGHLY DEVELOPED.

### I.—ORDO CALCISPONGIÆ.

SPONGIÆ POSSESSING A SKELETON COMPOSED OF CARBONATE OF LIME WITH A LITTLE ORGANIC SUBSTANCE, GASTRULA FORMED BY INVAGINATION.

### I.—SUBORDO HOMOCÆLA. Von Lendenfeld.

Calcispongiæ the Entoderm of which consists throughout of frilled flagellate cells. No histological difference between the Entodermal clothing of the central gastral cavity and that of its branches.

This Subordo is nearly identical with the Homocoela of Poléjaeff (1) but comprises some species, which according to Poléjaeff would be considered Heterocoela.

FAMILY. ASCONIDÆ. Claus (2).

Sac-shaped Homocoela often forming colonies without a thick Mesoderm which the Canals perforate. The Asconidæ are identical with Haeckels (3) Ascones. Haeckel's genera are adopted preliminarily.

1. GENUS. ASCETTA. Haeckel (4).

With predominant triradiate spicules some of which may possess an incipient fourth ray, without acerate spicules.

1. SPECIES. ASCETTA DICTYOIDES. Von Lendenfeld.

ASCETTA PRIMORDIALIS var. DICTYOIDES. E. Haeckel (5).

Triradiate spicules regular, rays conic or semi spindle-shaped, pointed. Spicules forming several layers. Rays 8 to 16 times as long as thick with simple gastral cavity.

*Locality* : Australia. (Haeckel.)

2. SPECIES. ASCETTA POTERIUM. Von Lendenfeld.

ASCETTA PRIMORDIALIS var. POTERIUM. E. Haeckel (6).

CLATHRINA POTERIUM. Ridley (7).

LEUCOSOLENIA POTERIUM. Poléjaeff (8).

Triradiate spicules regular with straight, conic or semi-spindle-shaped rays in several layers. The dermal spicules clumsy with

(1.) *N. Poléjaeff*. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 35,

The new species described here have been partly obtained by the author himself, and were partly furnished by the Colonial Museums. I am particularly indebted to Mr. E. P. Ramsay for some highly interesting specimens from the Australian Museum in Sydney.

(2.) *C. Claus*. Grundzüge der Zoologie. Vierte Auflage. Band I., Seite 221.

(3.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 11.

(4.) *E. Haeckel*. L.c. Band II., Seite 14.

(5.) *E. Haeckel*. L.c. Band II., Seite 17-23; Band III., Taf. V., fig. 1.

(6.) *E. Haeckel*. L.c. Band II., Seite 17; Band III., Taf. II., figs. 8-9, Taf. V., fig. 1f-1i.

(7.) *Stuart O. Ridley*. Proceedings of the Zoological Society of London, 1881, p. 133.

(8.) *N. Poléjaeff*. L.c., p. 35; Taf. III., figs. 1-2.

rays which are 6 to 8 times as long as thick. The Gastral ones more slender with rays which are 16 to 20 times as long as thick. Triradiate spicules of the wall of the Pseudostoma with equal angles and paired rays.

Dormal rays, 0.18—0.3 x 0.01—0.035.

Gastral rays, 0.12—0.18 x 0.006—0.01.

Always Auloplegma-form.

*Locality*: East Coast of Australia (Twofold Bay, Challenger), and other places on the Australian Coast. Haeckel.

### 3. SPECIES. ASCETTA LOCULOSA. Von Lendenfeld.

ASCETTA PRIMORDIALIS var. LOCULOSA. E. Haeckel (1.)

Triradiate spicules regular, rays conic or semi-spindleshaped, pointed.

Spicules in several layers. All of the same size, the rays 8 to 16 times as long as thick. From the Gastral wall Lamellæ extend inward which divide the Gastral cavity into numerous compartments. Haeckel (2.) states that these folds are covered by several layers of entodermal Epithelium.

Poléjaeff (3.) doubts the correctness of this statement, and also I can state that I have never met with such a structure in any calcarious sponge.

*Locality*: Australia. Haeckel.

### 4. SPECIES. ASCETTA CHALLENGERI. Von Lendenfeld.

LEUCOSOLENIA CHALLENGERI. N. Poléjaeff. (4.)

The triradiate spicules form two layers; a Gastral one of regular spicules and a dermal one of irregular sagittal differentiated triradiate spicules.

(1.) E. Haeckel. Die Kalkschwämme. Eine Monographie. Band II., Seite 17, 23.

(2.) E. Haeckel. L.c., Band I., Seite 144. Band II., Seite 17, 23.

(3.) N. Poléjaeff. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., page 6.

(4.) N. Poléjaeff: L.c., p. 38; Taf. I., fig. 1; Taf. III., fig. 4,

The only specimen is a *Soleniscus* with 0·3—0·8 broad persons. The Pseudopores have a diameter of 0·28. The clumsy colony which is 30 mm. in length is sessile on a 2 mm. long peduncle. The Oscula are slightly larger than the pores in the reticulation.

Regular spicules with cylindrical, rounded rays, which are 0·18 long and 0·01 thick. The irregular dermal spicules are of the same size as the above, but with paired angles and generally in such a way irregular, that their rays are not situated in one plane. The paired rays which inclose the unpaired angles are slightly curved, convex towards each other.

Besides these there are a few regular spicules with rays 0·8 mm. long.

*Colour*: Yellowish.

*Locality*: North Coast of Australia, Cape York (Challenger.)

#### 5. SPECIES. ASCETTA PROCUMBENS. Nov. spec.

The sponge consists of numerous slightly curved cylindrical tubes, extending in one plane, in one or more layers. The sponge has the appearance of a perforated plate, and attains a diameter of 25 and a thickness of 2·5 mm.

The spicules are regular. The rays are 0·1 mm. long and at the base 0·015 thick. The rays are pretty stout, conic and slightly rounded at the ends. Our species is distinguished from the allied species by the rays of its spicules being neither cylindrical as in *Ascetta coriacea* nor pointed as in the numerous varieties of *Ascetta primordialis*. Besides that, the spicules are shorter than in the latter and thicker than in the former.

*Locality*: East coast of Australia (Port Jackson.) South coast of Australia (Port Phillip), von Lendenfeld.

#### 6. SPECIES. ASCETTA MACLEAYI. Nov. spec.

Triradiate spicules forming low triangular pyramids with equal angles. One ray always longitudinally situated, longer than the other two and pointing towards the aboral pole. Longitudinal ray 0·05 (Pseudo-osculum)—0·1 (body and peduncle)  $\times$  0·003—

0·007. Lateral rays 0·04—0·05 x 0·003—0·004 mm. Rays conic, rounded at the end, rarely with a slight stricture just below. Auloplegmaform with Pseudo-osculum; a reticulate colony like guancha blanca (1). The canals (Ascon-individuals) with small inhalent pores on the outer side and larger exhalent pores towards the Pseudo-garter.

(Transition form between Asconidæ and Nardopsidæ.)

Colonies 3-10 mm. high, peduncle as long, or longer than the reticulated part of the body.

*Locality*: East coast of Australia (Port Jackson), Laminarian zone. Von Lendenfeld.

## 2. GENUS. ASCALTIS. Haeckel (2.)

Asconidæ with tri- and quadriradiate spicules. Without acerate spicules.

7. SPECIES. ASCALTIS LAMARCKII. Haeckel (3.)

LEUCOSOLENIA LAMARCKII. N. Poléjaeff (4.)

Tri- and quadriradiates regular. Some of the triradiates three times as large as the other triradiates and the quadriradiates. Quadriradiates and small triradiates with rays 0·08—0·12 x 0·004—0·006. The large triradiates with rays 0·2—0·3 x 0·015—0·02 mm. Auloplegma form. Spherical 5-20 mm. in diameter.

*Locality*: East Coast of Australia, (Port Jackson, Challenger.) 30-35 fathoms.

## 3. GENUS. ASCANDRA. Haeckel (5.)

Asconidæ with triradiate, quadriradiate and acerate spicules.

(1.) *N. M. Maclay*: Jenaische Zeitschrift für Naturwissenschaft, Band IV., 2 Heft, 1868, Seite 221.

(2.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 51.

(3.) *E. Haeckel*. L.c. Band II., Seite 60; Taf. IX., fig. 5; Taf. X., fig. 4 a-d.

(4.) *N. Poléjaeff*. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger, Tart. XXIV., p. 36.

(5.) *E. Haeckel*. L.c. Band II., Seite 80.

## 8. SPECIES. ASCANDRA DENSA. Haeckel (1).

Tri- and rare quadriradiate spicules regular, of equal size. Rays straight cylindrical and pointed. Apical ray half as thick, straight. Acerate spicules straight truncate on both ends, inflated on the external end, 3-4 times as long, and 5-6 times as thick as the ray of the triradiates. Triradiates  $0.1-0.12 \times 0.006-0.001$  mm. Acerates  $0.5-0.6 \times 0.03-0.04$  mm., with or without Pseudo-oscula.

*Locality* : South Coast of Australia, Haeckel.

## 2. FAMILY. HOMODERMIDÆ. Von Lendenfeld (2.)

Homocœla with radial tubes.

Transition form between Asconidæ and Syconidæ.

## 4. GENUS. HOMODERMA. Von Lendenfeld (3.)

Homodermidæ which form colonies of several spindle-shaped persons; the Gastral cavities of which are connected with each other by a hollow Spongorhiza.

## 9. SPECIES. HOMODERMA SYCANDRA. Von Lendenfeld (4.)

Quadriradiate, triradiate and acerate spicules. The radial tubes in regular strobiloid circles around the cylindrical Gastral cavity which is clothed up to the margin of the Osculum with frilled flagellate cells. Gastral quadriradiates, centripetal radial ray  $0.02-0.04 \times 0.0024$  conic, pointed and straight; lateral tangential ray slightly curved, convex outside  $0.05 \times 0.0038$ ; longitudinal, aboral tangential ray  $0.04 \times 0.0038$ . Parenchymal triradiates; internal triradiates with unequal rays, radial centrifugal ray  $0.048 \times 0.0032$  conic, sometimes protruding into the Gastral cavity. Tangential basal rays curved  $0.0074-0.011 \times 0.0048$ , convex towards the outer side often equatorially situated.

(1.) *E. Haeckel*. L.c. Band II., Seite 85, Taf. XIV., figs. 2a-2c; Taf. XVII., fig. 9-12.

(2.) *Von Lendenfeld*. Proceedings of the Linnean Society of N.S.W., Vol. IX., p. 338.

(3.) *Von Lendenfeld*. L.c.

(4.) *Von Lendenfeld*. L.c.

Medial triradiates regular, rays conic  $0.048 \times 0.003$ . Dermal rays similar in size and shape to the former on the summits of the radial tubes some triradiates are situated, the outer rays of which protrude beyond the surface. Dermal acerates protruding and leaning towards the Osculum under an angle of  $45^\circ$   $0.71 \times 0.0071$  mm., cylindrical, pointed, the centrifugal end abruptly pointed to a sharp point. Situated in groups of 10 to 12 on the summits of the radial tubes. Oscular acerates a longitudinal cylinder forming a kind of Oesophagus with a frill of horizontal acerates. The former slightly curved, convex on the inner side  $0.57 \times 0.0016$ , the latter  $0.21 \times 0.003$  slightly concave to the front.

Persons attaining a height of 14 mm., and a breadth of 5 mm.

Homoderma Sycandra is connected with the Asconidæ by forms such as *Ascaltis canariensis* (1), and *Ascaltis Gegenbauri* (2.)

*Locality*: East Coast of Australia, Port Jackson, South Coast of Australia, Port Phillip, Von Lendenfeld.

### 3. FAMILY. LEUCOPSIDÆ. Von Lendenfeld.

Homocoela with a highly developed Mesoderm in which the mouthless ascon persons are imbedded. With a large Pseudogaster and Pseudostom.

Transition-form between Asconidæ and Leuconidæ.

### 5. GENUS. LEUCOPSIS. Von Lendenfeld.

Leucopsidæ without any canal system. The inhalent Pores of the Ascon tube reticulation small and in direct communication with outer water. The exhalent Pores large and opening direct into the Pseudogaster.

### 10. SPECIES. LEUCOPSIS PEDUNCULATA, nov. sp.

A pedunculate small Sponge with one or several Oscula. The peduncle is hollow and clothed with ectodermal pavement cells internally. On the summit of it a spherical Sponge is situated

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(1.) *E. Haeckel*. L.c. Seite 52., Taf. IX., figs. 1-3; Taf. X., figs. 1a-1c.  
 (2.) *E. Haeckel*. L.c. Seite 62, Taf IX, figs. 6-8; Taf. X., figs. 5a-5d.

which possesses triradiate spicules only, scattered throughout the Mesoderm which is exceptionally rich in cells. Tangential multipolar tissue cells and glandcells are met with. The spicules have one longer ray mostly pointing towards the aboral pole. The longitudinal ray measures 0·074—0·11 x 0·0074; and the paired rays 0·056—0·0074 x 0·004—0·006 mm. The three angles are equal. Height 3 to 7 mm, breadth 3 to 4 mm. Peduncle half as long as the body.

*Locality*: East Coast of Australia, Port Jackson, Laminaria zone, Von Lendenfeld.

## II.—SUBORDO HETEROCOELA.

Von Lendenfeld.

Calcispongiæ with differentiated Entoderm. Ciliated chambers clothed with frilled flagellate cells are always present. The gastral cavity is clothed with entodermal pavement cells.

I adopt Poléjaeff's (1) name with a different definition but nearly identical meaning.

### 1. FAMILY. SYCONIDÆ. Claus (2).

Heterocoela with cylindrical ciliated chambers which traverse the body-wall, are situated radially, and open direct into the gastral cavity. Sensitive cells around the inhalent pores. Identical with Haeckel's (3) Sycones.

Connected with Asconidæ by Homoderma and with Leuconidæ by Vosmaeria

#### 1. SUB-FAMILY. SYCONINÆ. Von Lendenfeld.

Syconidæ with unbranched distally separate ciliated tubes, and without complicated canal system. (Subgenera with the end syllable "aga" of Haeckel (4))

(1.) *N. Poléjaeff*. L.c. P. 39.

(2.) *C. Claus*. Grundzüge der Zoologie. Vierte Auflage. Band I, Seite 221.

(3.) *E. Haeckel*. L.c. Band II., Seite 232.

(4.) *E. Haeckel*. L.c. Band II.

I divide this Subfamily, which comprises a great number of the Sycones of Haeckel, according to Haeckel's principle preliminarily into the seven genera, which according to Haeckel (1) comprise *all* Syconidæ.

6. GENUS. SYCETTA. Von Lendenfeld.

Syconidæ, with predominant triradiate spicules, which sometimes show an incipient fourth ray, without acerate spicules. Identical with Haeckel's (2), sub-genus *Sycettaga*.

11. SPECIES. SYCETTA PRIMITIVA. Haeckel (3).

Radial tubes conic or bell-shaped, free; between them wide free intercanals. On both ends of each tubus an ostium, the gastral ostium three times as large as the dermal one, dermal surface and gastral surface smooth. Triradiate spicules of the skeleton all of the same regular shape, with equal angles and rays, rays straight, slender conic, 10 to 15 times as long as thick, with sharp point. All triradiate spicules are situated in regular order, with parallel rays, the basal ray is directed aborally downward in the gastral-surface, and centrifugally outward in the tubar-surface.

*Colour*: White (in spirits.)

*Locality*: South coast of Australia (Bass's Straits, Wendt; St. Vincent Gulf, Schomburgk.)

7. GENUS. SYCANDRA. Von Lendenfeld.

Syconinæ with acerate, triradiate and quadriradiate spicules. Comprising Haeckel's (4.) Subgenera *Sycocarpus*, *Sycocercus*, *Sycocubus*, *Sycotrobis*.

(1) *E. Haeckel*. L.c.

(2.) *E. Haeckel*. L.c. Band II., Seite 236.

(3.) *E. Haeckel*. L.c. Band II., Seite 237, Taf. XLI.

(4.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 294-295.

## 12. SPECIES. SYCANDRA CORONATA. Haeckel (1).

- Spongia coronata. Ellis and Solander (2.)  
 Spongia coronata. A. F. Schweiger (3.)  
 Scyphor coronata. F. Gray (4.)  
 Spongia coronata. R. E. Grant (5.)  
 Spongia coronata. R. E. Grant (6.)  
 Grantia coronata. Hassal (7.)  
 Sycum coronatum. E. Haeckel (8.)  
 Sycumella tubulosa. E. Haeckel (9.)  
 Grantia ciliata. T. S. Bowerbank (10.)  
 Grantia ciliata. T. S. Bowerbank (11.)

Radial tubes cylindrical, with slender distal cones, quite free or adnate at the base, between these quite free intercanal spaces. Dermal surface villose, Gastral surface bristly, Acerate spicules forming a bundle at the distal end of the radial tubes; they are several times longer and 2 to 3 times as thick as the triradiate and quadriradiate spicules. Tubar triradiate spicules subregular or sagittal, with straight basal rays, curved lateral rays and large lateral angles. Gastral quadriradiate spicules without order,

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(1.) *E. Haeckel*. L.c. Band II., Seite 304; Taf. LI., figs. 2a.-2t. Taf. LX., figs. 1-6.

(2.) *Ellis and Solander*. The Natural History of many curious and uncommon Zoophytes, 1786, p. 190; Taf. LVIII., figs. 8-9.

(3.) *A. F. Schweiger*. Beobachtungen auf naturhistorischen Reisen über Corallen etc., 1819, page 80. Taf. V., fig. XXXVII.

(4.) *F. Gray*. British Plants. Vol. 1., p. 357.

(5.) *R. E. Grant*. Remarks on the structure of some calcareous sponges. In the new Philosophical Journal of Edinburgh. Vol. I., 1826, p. 166.

(6.) *R. E. Grant*. Observations and Experiments on the Structure and Functions of the Sponges. In the new Philosophical Journal of Edinburgh. Vol. II., p. 122. Pl. II., figs. 17-18.

(7.) *Hassal*. Annals and Magazine of Natural History. Vol. VI., p. 174.

(8.) *E. Haeckel*. Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft 1870. Band V. Heft 2, p. 239.

(9.) *E. Haeckel*. Prodromus l.c., p. 239.

(10.) *T. S. Bowerbank*. On the Organisation of *Grantia ciliata*. Transactions of the Microscopical Society. New series. Vol. VII., 1859, p. 79-84, pl. LXXV., figs. 1-5.

(11.) *T. S. Bowerbank*. A Monograph of the British Spongidae, 1864. Vol. I., pl. XXVI., figs. 345, 346a; *T. S. Bowerbank*, l.c. Vol. II., p. 19.

mostly subregular, more rarely sagittal or regular. Their facial rays mostly straight, about as long or a little longer than the slightly curved apical-ray.

*Colour* : White, silvery-grey or yellowish.

*Locality* : Mediterranean (Lesina, Nice, Gibraltar, Haeckel) ; Atlantic Ocean, Coast of Portugal, Barbozza du Boyage ; Bretagne, Mièvre ; Normandie, Lazaze-Duthiers, Grube ; South Coast of England, Montagu ; Torquay, Griffiths, Weymouth, Max Schultze ; Pacific Ocean, California, Brown ; Honolulu, Sandwich Islands, Haltermann ; East Coast of Australia, Wendt.

13. SPECIES. SYCANDRA INCONSPICUA. Nov. spec.

Cylindrical erect persons remaining solitary with a small frill of longitudinal Acerates around the terminal, circular Osculum. Height 10 to 15 mm., breadth 4 to 7 mm. Dermal cones small, flat dome-shaped. Inhalent canals very narrow, hardly visible, with triangular section.

Spicules. Gastral quadriradiate spicules with three tangential rays below the surface and one longer radial one, penetrating the Gastral wall. Radial ray pointing inward 0·14—0·2 x 0·0048 mm., pointed abruptly, slightly bent towards the Osculum. Three tangential rays equal and nearly straight 0·074 x 0·004 pointed abruptly. Parenchymal triradiates regular with conic slightly rounded rarely bent rays, measuring 0·12 x 0·007—0·008. Dermal acerate spicules 0·8 x 1·2 mm., x 0·016 mm., curved regularly towards the Osculum ; densely scattered over the surface, pointed abruptly on the outer end, conic proximally.

*Locality* : East Coast of New Zealand, Lyttelton. Von Lendenfeld.

14. SPECIES. SYCANDRA RAPHANUS. Haeckel (1.)

Sycon raphanus. O. Schmidt (2.)

Sycon raphanus. O. Schmidt (3.)

(1.) *E. Haeckel* Die Kalkschwämme. Eine Monographie. Band II., Seite 312, Taf. LIII., figs. 4a-4t ; Taf. LX., fig. 7.

(2.) *O. Schmidt*. Die Spongien des Adriatischen Meeres. Leipzig, 1864, p. 14, Taf. I., fig. 2.

(3.) *O. Schmidt*. III. Supplement-Heft der Spongien des Adriatischen Meeres, p. 32.

- Grantia raphanus*. T. E. Gray (1.)  
*Sycum raphanus*. E. Haeckel (2.)  
*Sycon ciliatum*. O. Schmidt (3.)  
*Sycon ciliatum*. N. Lieberkuehn (4.)  
*Spongia inflata*. S. delle Chiage (5.)  
*Sycum inflatum*. E. Haeckel (6.)  
*Sycarium vesica*. E. Haeckel (7.)  
*Syconella proboscidea*. E. Haeckel (8.)  
*Sycum tergestinum*. E. Haeckel (9.)  
*Sycodendrum procumbens*. E. Haeckel (10.)  
*Sycandra raphanus*. F. E. Schulze (11.)  
*Sycandra raphanus*. H. T. Carter (12.)

Radial tubes cylindrical-prismatic, mostly hexagonal, coalesce with their edges throughout the whole length to the low distal conus. Between those triangular prismatic inter-canals. Dermal surface corymbate-shaggy. Gastral surface with slender and small spines. Acerate spicules only at the distal conus of each tube forming a thinner or thicker bundle, cylindrical, straight or curved, at both ends tapering continuously to a fine point much longer, and 2 to 4 times as thick as the triradiate and quadri-radiate spicules. Tubar triradiate spicules sagittal, with unequal

(1.) *T. E. Gray*. Notes on the arrangements of Sponges, with the description of some new Genera. Proceedings of the Zoological Society of London, 1867, p. 554.

(2.) *E. Haeckel*. Prodomus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1870. Band V., Heft 2, p. 239.

(3.) *O. Schmidt*. Adriatische Spongien, l.c., p. 14, Taf. I., figs. 1-1d.

(4.) *N. Lieberkuehn*. Neue Beiträge zur Anatomie der Spongien. Archiv für Anatomie und Physiologie, 1859, p. 373, Taf. IX., fig. 3.

(5.) *S. delle Chiage*. Memoire sulla storia e notomia degli animali senza vertebrate nopoly, Vol. III., p. 114.

(6.) *E. Haeckel*. Prodomus, l.c., p. 239.

(7.) *E. Haeckel*. Prodomus, l.c., p. 238.

(8.) *E. Haeckel*. Prodomus, l.c., p. 239.

(9.) *E. Haeckel*. Prodomus, l.c., p. 239.

(10.) *E. Haeckel*. Prodomus, l.c., p. 245.

(11.) *F. E. Schulze*. Ueber den Bau and die Entwicklung von *Sycandra raphanus*, Haeckel. Zeitschrift für wissenschaftliche Zoologie. Band XXV., Suppl., Seite 247, Taf. XVIII., XIX., XX., XXI.

(12.) *H. T. Carter*. On *Grantia ciliata*, var. *spinispiculum*, Crtr. Annals and Magazine of Natural History. Fifth Series. Vol. XIII., 1884, p. 153.

obtuse angles, the straight basal ray just as long or a little longer than the curved lateral rays. Gastral triradiate and quadri radiate spicules mostly regular or sub-regular with straight or slightly curved radii, nearly as long and thick as the tubar triradiate spicules. The slightly curved apical ray a little shorter than the 3 facial rays.

*Colour*: White, grey, or yellowish, seldom brown.

*Locality*: Mediterranean (Nice, Naples, Messina, Triest, Lesina, Haeckel; Triest, Zara, Sebenico, Lesina, Cette, O. Schmidt; Triest, Lieberkuehn); Red Sea, Siemens; Indian Ocean, Ceylon, Wright; Australia, St. Vincent's Gulf, Schomburgk; Bass's Straits, Wendt; Philippines, Bohol, Semper; Japan, Jeddo, Gildemeister.

15. SPECIES. SYCANDRA ARBOREA. Haeckel (1.)

SYCON ARBOREA. Poléjaeff (2.)

Branched colonies composed of more or less cylindrical Sycon-Persons. No peduncles and small frills. Colonies composed of from 5 to 30 persons. Each measuring from 8-20 mm. in length and from 4 to 8 mm. in diameter. Inhalent pores very regularly disposed and surrounded by rings of sensitive cells and a sphincter. They lead into spherical subdermal extensions of the intercanals, which are wide and have a quadratic transverse section.

*Spicules*: Gastral quadri radiate spicules. The radial centripetal ray pointing towards the Osculum and also curved in that direction, pointed, conic 0.04—0.06 exceptionally 0.08 x 0.008 (Haeckel), 0.08 x 0.008 my measurements. The two aboral rays paired and straight, the other longitudinal and curved, concave towards the gastral cavity. All of equal size, 0.037—0.04 x 0.006. Parenchymal Triradiates sagittal. Lateral rays 0.06—0.1 x 0.005—0.006. The unpaired ray in the proximal part of the ciliated tubes shorter than the others 0.05 x 0.004; in the distal part longer, 0.12 x 0.007 mm. Dermal acerates short and stout,

(1.) *E. Haeckel*. L.c., Seite 331; Taf. LIII., figs. 1a-1t; Taf. LVIII. fig. 7.

(2.) *N. Poléjaeff*. L.c. Part XXIV., p 40.

curved and irregularly amassed on the summits of the ciliated tubes. In each group 6-10 long, acerates 0.96—1 x 0.05, and very numerous; shorter ones 0.02—0.04 mm. long of the same thickness. All these are inflated at the distal ends. The terminal knobs form a hard pavement. They have a diameter of 0.08—0.1 mm.

*Locality*: East coast of Australia; Sydney, Frauenfeld; Port Jackson, von Lendenfeld; South Coast of Australia; Bass's Straits, Wendt; Moncoeur Island, Challenger; Port Phillip, von Lendenfeld.

16. SPECIES. SYCANDRA ALCYONCELLUM. Haeckel (1.)

*Alcyoncellum gelatinosum*. de Blainville (2.)

*Alcyoncellum gelatinosum*. T. E. Gray (3.)

*Sycidium gelatinosum*. E. Haeckel (4.)

*Grantia gelatinosa*. T. S. Bowerbank (5.)

*Grantia virgultosa*. T. S. Bowerbank (6.)

Radial tubes prismatic, mostly octagonal, coalesce with their edges throughout the whole length to the low distal conus, between them narrow quadrangular prismatic inter-canals are situated. Dermal surface smooth, plain, regularly pannelled. Gastral surface covered thickly with bristles and spines. Acerate spicules forming only at the distal conus of each tubus, a dense and short reversed conic bundle, the base of which is a hexangular dermal pannel. Acerate spicules partly club-shaped, partly nail-shaped. The inner ends are thin

(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., p. 333. Band III; Taf. LIIII., figs. 2o-2d; Taf. LVIII.

(2.) *M. H. de Blainville*. Manual d'Actinologie ou de Zoophytologie, Paris 1834, p. 529, pl. XCII., fig. 5.

(3.) *T. E. Gray*. Notes on the Arrangements of Sponges with the Description of some New Genera. Proceedings of the Zoological Society, 1867, p. 557.

(4.) *E. Haeckel*. Prodomus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft. Band V., Heft 2, p. 245.

(5.) *T. S. Bowerbank*. On the Generic name *Alcyoncellum*. Annals and Magazine of Natural History, 1869. Vol. III., p. 84.

(6.) *T. S. Bowerbank*. Manuscript.

and pointed, the outer ends thick and rounded. Tubar triradiate spicules with right angles, the proximal and distal spicules more or less differentiated. Gastral quadriradiates mostly regular or sub-regular, with straight and thin facial rays. Their apical ray very strong, cylindrical or spindle-shaped, straight or slightly curved, thicker and longer (twice as large) as the rays of the proximal triradiate spicules.

*Colour*: Dry, and in spirit, white or yellowish.

*Locality*: Indian Ocean, Quoy et Gaimard; Java, Mulder; West Coast of Australia, Harvey; Fremantle, G. Clifton; Mouth of the Murray River, Ray.

17. SPECIES. SYCANDRA RAMSAYI. Nov. spec.

Sac-shaped or spherical Sycandræ which never form colonies, obtaining a height of 50, and a diameter of 40 mm. The body wall is very thick, so that even the largest specimens have a comparatively small Gastral cavity which is more or less tubular, sac-shaped. In consequence of the thickness of the body wall, the ciliated tubes attain an exceptional length; they are longest in the middle of the Sponge. Their length decreases towards the oral and aboral end. The Sponge attains in consequence of the long protruding dermal acerates, a very hairy appearance. The circular Osculum 5 to 10 mm., in diameter, is surrounded by a frill of very long (4 mm.) longitudinal Acerates. The protruding nearly conic distal end of the ciliated tubes are crowned by clusters of very long and slender acerates.

*Spicules*: Gastral radiate spicules very slender, irregular. Centripetal radial ray conic or cylindrical nearly straight,  $0.22 \times 0.005$ ; transverse tangential rays straight,  $0.2 \times 0.0048$  longitudinal tangential ray  $0.1 \times 0.003-0.004$  pointing towards the aboral pole. The centripetal radial rays protrude into the Gastral cavity.

*Parenchymal Spicules*: Triradiates and quadriradiates with numerous transition forms. The largest quadriradiates perfectly regular, all rays straight slender and slightly conic.  $0.17 \times 0.0048$ . The rays of the largest triradiates which are likewise regular, of

the same dimensions. Towards the outer surface, the spicules become sigittal, the unpaired rays always being longer and pointing outwards.

Measurement of the dermal quadri-radiates and tri-radiates :

Centrifugal ray 0.15—0.18 x 0.006 ; tangential rays 0.07—0.12 x 0.006. Dermal protruding acerates straight, slightly leaning towards the Osculum, cylindrical in the centre end conic at both ends ; the proximal end more abruptly pointed than the distal end. 1.8—2.5 x 0.021 mm.

*Locality* : East Coast of Australia, Port Jackson, " Bottle and Glass," on black mud, 10 fathoms. Ramsay.

This Sponge, one of the most beautiful in Port Jackson, was provisionally set down by Miklouho-Maclay (manuscript), as *Baeria* Ramsayi. The Genus *Baeria* may with further investigation be re-established, when we are in a position to replace Haeckel's artificial classification by a more natural one. The specific name has been adopted.

## II. SUB-FAMILY. UTEINÆ. Von Lendenfeld.

Syconidæ the ciliated tubes of which coalesce throughout, so that there are no projecting distal cones, but a smooth and continuous outer surface. The tubes are simple unbranched ; no complicated canal system.

### 8. GENUS. GRANTESSA. Von Lendenfeld.

Uteinæ with sparsely scattered bunches of long dermal protruding Acerates, which are not determined in their number or position by the ciliated tubes. Sensitive cells in clusters on the inner side of the strictures which surround the inhalent pores.

### 18. SPECIES. GRATESSA SACCA. Nov. spec.

Large sackshaped Uteinæ, which do not form colonies and are characterized by the largeness of their gastral cavity and the thinness of the body-wall. The sponge attains a length of 80 mm., and has the shape of a straight or slightly curved cylinder, with a circular transverse section, and a diameter of 20 to 25 mm. The body wall

is only 2 to 2.5 mm. thick. Intercanals triangular regular and conspicuous connected with the outer water by small pores which pervade the dermal layer. No subdermal cavities.

*Spicules*: Gastric quadriradiates rare. One differentiated ray protruding into the gastral cavity, straight, short and stout, conic and pointed  $0.055-0.006 \times 0.005$ . Tangential rays regular in one plane, vertical to the centripetal ray  $0.07 \times 0.005$ .

Triradiate spicules of the Parenchyma, sigittally differentiated. Centrifugal unpaired ray straight, conic, rounded at the end  $0.2-0.3 \times 0.006-0.007$  mm; the paired rays slightly bent irregularly or curved with the convex side looking inwards  $0.11 \times 0.005$ . Regular Triradiates with straight, cylindrical, abruptly pointed rays are met with towards the outer surface. Their rays measure  $0.1-0.14 \times 0.007$ . Dermal Triradiates similar in shape to the sagittal ones in the Parenchyma are very numerous. Their unpaired ray is situated radially and points inwards. The paired rays stand nearly vertical on the sagittal one and are very variable in size, always however very slender; they form a dense and hard dermal felt. The dermal acerate spicules are cylindrical and pointed at both ends, more abruptly at the distal end. They are very slender and in specimens nearly always broken off in consequence of their extreme tenderness. They measure  $2-3 \times 0.014$  mm. These spicules are amassed in clusters of 10 to 15 and they protrude  $\frac{5}{8}$ ths of their length beyond the surface, on which they stand vertical. The clusters are regularly disposed and situated at intervals of about 2 mm., from one another. In these "villi" also small linear Acerates are met with.

*Locality*: East Coast of Australia, Port Jackson on rocky bottom 5 to 10 fathoms. Ramsay, Von Lendenfeld.

#### 9. GENUS. UTE. O. Schmidt (1).

Uteinæ, with a cortex consisting mainly of several layers of large acerate spicules disposed tangentially.

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(1.) O. Schmidt. Die Spongien des Adriatischen Meeres. Leipzig, 1862. Seite 16.

## 19. SPECIES. UTE ARGENTEA. Poléjaeff (1.)

The Sponge has the shape of an elongated tube, 40 mm. long and 3 mm. thick. (The only specimen.) Bodywall 0.5 mm. thick. Half of its thickness is taken up by the strong cortex. Outer surface smooth.

*Skeleton of the gastric surface* : This consists of an outer layer of quadriradiate, of an inner layer of quadriradiate or triradiate, and of minute acerate spicules, scattered amongst those just mentioned without any regular order.

*Outer quadriradiate Spicules* : Basal and lateral rays straight, sharply or rather bluntly pointed, all of the same diameter, 0.01 mm., and usually of the same length (0.25 mm. on an average); basal ray forming with each of lateral rays an angle of  $115^{\circ}$ ; apical ray curved tapering from the base to a sharp point, reaching 0.15 mm. in length with a diameter of 0.01.

*Inner quadriradiate Spicules* : Basal ray straight, tapering from base to sharp point, usually rather thinner than lateral rays, forming with each of them an angle of about  $100^{\circ}$ , length inconstant, varying from 0.18 mm. to 0.5 mm.; lateral rays curved inwards, tapering from the base to sharp points, reaching 0.3 mm. in length, 0.0125 mm. in diameter; most of them are truly quadriradiate, their apical ray being occasionally longer, 0.2 mm., than that of the outer quadriradiate spicules; its length is, however, variable, and there are amongst the inner quadriradiate spicules others with a merely incipient apical ray, and even quite deprived of it.

*Minute acerate Spicules* : Straight or slightly curved, spindle-shaped, tapering from the centre to a sharp point at either extremity, usually 0.1 mm. long 0.002 mm. in diameter.

*Skeleton of the radial tubes* : The tubar skeleton consists of sub-gastric triradiate spicules, reaching with their centrifugally

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(1.) *N. Poléjaeff*. Report on the Calcareae. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 43, pl. I, fig. 3; pl. IV., fig. 3; pl. V., fig. 1a-1p.

directed basal ray to the zone of the cortical acerate spicules. Tuber Acerate lying parallel to the basal ray just mentioned, and tubar quadriradiate spicules scattered here and there at the bottom of the radial tubes.

*Subgastric triradiate Spicules*: All rays of the same thickness, 0.013 mm; basal ray straight, tapering from the base to a sharp point, its average length 0.3 mm.; lateral rays slightly curved inwards, forming with basal ray an angle varying from 100° to 110°, rarely exceeding 0.15 mm. in length.

*Tubar quadriradiate Spicules*: All rays in different planes, lateral rays forming one curve, basal and apical rays another; basal ray bluntly pointed, cylindrical 0.0025 mm. thick, rarely longer than 0.003 mm.; lateral rays straight or slightly curved, tapering from the base to sharp points, each forming with basal ray an angle of about 110°, reaching 0.05 mm. in length, with a diameter of 0.002; apical ray slightly curved, sharp pointed, of the same diameter as lateral rays, but usually three times shorter.

*Tubar acerate Spicules*: Straight or slightly curved, tapering from the centre to sharp points, rarely longer than 0.3 mm., with a diameter of 0.005.

*Skeleton of the Cortex*: The skeleton of the Cortex consists of large spindle-shaped acerate, of minute acerate, and of sagittal triradiate spicules, with the basal ray directed towards the closed end of the Sponge.

*Large acerate spicules* straight or slightly curved, tapering from the centre to a sharp point at either end; length varying from 1 to 3 mm., diameter from 0.05 to 0.12 mm.

*Minute acerate Spicules*: Like those of the gastric surface spindle-shaped, straight, or slightly curved, tapering from the centre to sharp points, rarely exceeding 0.15 mm. in length and 0.0028 mm. in diameter.

*Sagittal triradiate Spicules*: Basal ray smooth, either of cylindrical form or tapering from the base to a sharp point, reaching 0.75 mm. in length, with a diameter of 0.005; lateral rays sharp pointed, forming with basal ray an angle of 112°,

either straight or more frequently slightly curved, usually inwards, twice as thick as basal ray; length inconstant, varying from 0·025 mm. to 0·12 mm.

*Locality*: Station 163, April 7, 1874; latitude 36° 56' S., longitude 150° 30' E., depth 120 fathoms; off Twofold Bay, Australia. (Challenger.)

#### 10. GENUS. SYCORTUSA. Von Lendenfeld.

Uteinae with minute acerate spicules in the cortex. Identical with Haeckel's (1) Subgenus Sycortusa.

#### 20. SPECIES. SYCORTUSA LÆVIGATA. Von Lendenfeld.

SYCORTIS LÆVIGATA. Haeckel (2.)

Cylindrical radial-tubes irregularly prismatic, coalesce with their sides. No distal cones. Dermal surface and gastral surface smooth. Acerate spicules very small in dense masses felted in the dermal surface and forming a kind of cement, which covers the whole Sponge. Here we find regularly disposed sagittal triradiate spicules with straight rays, the basal ray which points to the aboral pole, of which is three times as long as the lateral rays. Tubar triradiate spicules sagittal, with straight rays; the mesial angle much larger than the paired ones. The basal ray two to three times as large as the lateral ones. Most of the gastral triradiate spicules irregular, with strongly curved unequal rays and very varying angles without any order closely packed in the gastral surface. All triradiate spicules of the skeleton of the same thickness, six times as thick as the minute acerate spicules of the dermal surface.

*Colour*: In spirit, white.

*Locality*: South Coast of Australia (St. Vincent's Gulf, Schomburgh.)

(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 278.

(2.) *E. Haeckel*. L.c. Seite 235. Taf. 49,

## 11. GENUS. AMPHORISCUS. Von Lendenfeld.

The radial rays of the dermal quadriradiate spicules and the centrifugal rays of the Gastral spicules are joined, or the former penetrate the whole thickness of the body wall.

This genus is nearly identical with Poléjaeff's *Amphoriscus*, Haeckel (1), but very different from Haeckel's (2) Genus *Amphoriscus*.

21. SPECIES. AMPHORISCUS CYLINDRUS. Von Lendenfeld.  
SYCILLA CYLINDRUS. Haeckel (3.)

Radial tubes prismatic, dermal surface flat, smooth. Gastral surface shortly spined. Gastral quadriradiates sagittal; rays cylindrical, straight and short truncate, 0.008—0.012 mm. thick. Basal ray 0.24, both lateral ones 0.16, the free apical ray which is slightly curved towards the Osculum only 0.06—0.09 mm.

Parenchymal quadriradiate spicules sagittal; radial rays 0.016 mm. thick. Basal 0.3, both lateral 0.2, and the straight centrifugal apical ray 0.5—0.6 mm.

Dermal quadriradiate spicules, all four rays are cylindrical at basal half, 0.024 mm. thick, in the apical half slender, conic. Basal ray straight, 0.5 mm. long, nearly twice as large as the lateral rays, which are only 0.3 mm. The centripetal apical ray, 0.8 mm., reaches to the subgastral layer.

*Locality*: Adriatic, E. Haeckel; East Coast of Australia, Port Jackson, von Lendenfeld.

## 22. SPECIES. AMPHORISCUS POCULUM. Poléjaeff (4.)

The single specimen representing this species in the Challenger collection is of tubular elongated form, 36 mm. long 4 mm. broad in its middle and superior part; towards the closed end the tube

(1.) *E. Haeckel*. L.c. Seite 46.

(2.) *E. Haeckel*. Prodröm eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1870. Band V., Heft 2., Seite 233.

(3.) *E. Haeckel*. L.c. Seite 254. Taf XLIII., fig. 5-7. Band III.

(4.) *Poléjaeff*. Report on the Calcareous. The Zoologie of the Voyage of H.M.S. Challenger, Part XXIV., p. 46, pl. IV., fig. 4; Pl. V., figs. 2a-2f.

becomes rather narrower. The individual is bare-mouthed; the outer and inner surfaces are slightly roughened by the cortical and gastric triradiate spicules respectively; the average thickness of the wall does not exceed 0.6 mm.

*Skeleton*: The skeleton consists of gastric triradiate, subgastric triradiate, subdermal triradiate, dermal triradiate and acerate spicules.

*Gastric triradiate spicules* sagittal, all rays in the same plane and of the same diameter 0.015 mm.; basal ray straight, tapering from the base to a sharp point, length inconstant, usually one and a half times as long as the lateral rays, often much shorter, lateral rays curved outwards, cylindrical, either sharply or rather bluntly pointed, each forming with basal ray an angle of about  $110^{\circ}$ , on an average 0.25 mm. long. *Subgastric triradiate spicules*, sagittal, all rays of the same diameter 0.02 mm.; basal ray straight, tapering from the base to a sharp point, usual length 0.38 to 0.45 mm., lateral rays sharp pointed, curved, often angularly bent in their middle or basal part rarely exceeding 0.275 mm. in length, forming with each other an angle varying from  $170^{\circ}$  to  $140^{\circ}$ , and with the basal ray an angle varying from  $106^{\circ}$  to  $120^{\circ}$ .

*Subdermal triradiate spicules* irregular; all rays usually of the same thickness, 0.015 mm., but of different lengths, lying in the same plane; basal ray straight, tapering from the base to a sharp point, rarely exceeding 0.1 mm. in length, occasionally rather thinner than lateral rays, forming with each of these an angle of about  $120^{\circ}$ ; lateral rays curved forwards, sharp pointed of different lengths, the longer directed centripetally, reaching 0.35 mm. often, however, considerably shorter, scarcely longer than the shorter ray, the length of which varies from 0.12 to 0.15 mm.

*Dermal triradiate spicules* sagittal; all rays of the same diameter, 0.02 mm., usually sharp pointed; basal ray straight, length inconsistent, not exceeding 0.425 mm.; lateral rays curved, each forming with basal ray an angle of about  $120^{\circ}$ ; average length 0.25 mm. *Acerate spicules* usually spindle-shaped, often

lanceolate, sharp pointed ; the lanceolate straight the spindle-shaped either straight or slightly curved ; attaining a length of 1 mm. and a diameter of 0·05 mm. ; a few much shorter and stouter, the proportion between the length and the thickness being 6:1 Sparsely scattered in the parenchyma, their free end projecting from the outer surface being usually broken off ; piercing the wall perpendicularly to the longitudinal axis of the Sponge.

*Colour* : Pale yellowish.

*Locality* : Station 163A, June 3, 1874 ; off Port Jackson, East Coast of Australia ; depths, 30 to 35 fathoms ; rock. (Challenger.)

23. SPECIES. AMPHORISCUS CYATHISCUS. Haeckel (1.)

SYCILLA CYATHISCUS. E. Haeckel (2.)

Radial tubes prismatic, coalesce entirely with their sides, no distal cone. Dermal surface plain, smooth, Gastral surface with short spines. The skeleton consists of quadrigonous spicules. The *quadrigonous* spicules of the skeleton possess throughout sagittally differentiated facial rays and form four layers:—  
 1. A dermal layer of parallel quadrigonous spicules, the straight basal ray and the knee-shaped lateral rays are situated in the dermal surface, whilst the centripetal apical ray penetrates the distal half of the gastral wall. 2. A subdermal layer, which is perfectly similar to the dermal one, and which lies just underneath it. 3. A subgastral layer of parallel quadrigonous spicules, the facial rays of which are situated underneath the gastral layer, whilst the centrifugal apical ray which is two to three times as long as the former, penetrates the greater part of the gastral wall. 4. A gastral layer of parallel quadrigonous spicules, the facial rays of which lie in the gastral surface. The apical ray is much shorter and protrudes into the gastral cavity. The dermal

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(1.) *E. Haeckel*. Prodröm eines Systems der Kalkschwämme Jenaische Zeitschrift für Medicin und Natur Wissenschaft, 1870. Band V., Heft. 2, p. 238.

(2.) *E. Haeckel*. Die Kalkschwämme, Eine Monographie. Band II., p. 250, Taf. XLIII., figs. 8-11, Band III.

quadriradiate spicules as thick as the gastral ones, and three to five times as thick as the gastral quadriradiate spicules.

*Colour* : White in spirits and in the dry state.

*Locality* : Coast of South Australia (Sonder.)

### III. SUB-FAMILY. GRANTINÆ. Von Lendenfeld.

Syconidæ with ramified ciliated tubes, with a complicated inhalent canal system.

#### 12. GENUS. GRANTIA. Von Lendenfeld

The skeleton consists of acerate, triradiate and quadriradiate spicules, which are all of the same size exclusively. Groups of sensitive cells around the inhalent pores. This Genus is nearly identical with Poléjaeff's "Grantia Fleming" (1), but very different from Flemings (2) original Genus Grantia. Transition-forms between Syconidæ, Syllébidæ and Leucopsidæ (3).

#### 24. SPECIES. GRANTIA LOBATA. Von Lendenfeld.

##### SYCANDRA COMPRESSA var. LOBATA. E. Haeckel (4).

The specimens of *Grantia compressa*, Fleming, in Australian waters are all cylindrical, solitary persons and must be referred to Haeckel's variety "lobata." I therefore consider myself justified in raising this variety to the rank of a species.

The Sponge attains a height of 25 mm. and a diameter of 6 mm. The body wall is 1.5 mm. thick. The ramifications of the ciliated tubes only slight.

*Spicules* : GASTRAL quadriradiate spicules irregularly scattered, generally disposed in such a manner that the sagittal ray stands

(1.) *N. Poléjaeff*. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger, Part XXIV., p. 41.

(2.) *J. Fleming*. History of British Animals, 1824, p. 524.

(3.) *F. E. Schulze* describes that also in *Sycandra* the ciliated tubes are slightly ramified, and may even form a reticulation at the base of the Sponge; sharp distinction between the families can of course not be expected.

(4.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Part II., Seite 362.

radial. Tangential rays  $0.1--0.15 \times 0.305$  mm., cylindrical slightly bent, pointed. Centripetal ray  $0.04--0.08 \times 0.007$  mm. shorter and thicker than the tangential ones. Triradiates of the Parenchyma sagittal, basal ray  $0.2 \times 0.007$ , lateral rays slightly curved  $0.09--0.12 \times 0.007$  mm. There are 2-3 layers of these spicules in the body-wall. The cortex contains triradiates and acerates. The former are mostly regular, disposed tangentially the three rays nearly in one plane cylindrical, pointed  $0.09--0.12 \times 0.007$  mm. The Acerates are bent on the outer end rectangularly so as to attain the shape of hooks. The longer portion is immersed in the sponge with its proximal two thirds and stands vertical on it and measures  $0.2 \times 0.014$  mm., the bent outer part  $0.05 \times 0.014$  mm., centripetal end conic, both pointed. The outer part of these Acerates points towards the Osculum.

*Locality*: East Coast of Australia, Port Jackson, V. Lendenfeld; Europe, E. Haeckel.

### 13. GENUS. HETEROPEGMA. Poléjaeff (1).

Grantinæ with a highly developed cortex containing triradiates and quadriradiates, totally different from those of the Parenchyma, ciliated tubes much branched.

#### 25. SPECIES. HETEROPEGMA NODUS GORDIL. Poléjaeff (2.)

This species forms colonies of a rather Asconoid appearance. The tubes, sometimes standing vertically, sometimes lying horizontally, ramify and interlace, thus constituting a kind of knot in which neither beginning nor end can be discerned. The individuality of the tubes is expressed only by Oscula, these latter being naked. The size of the Oscula is inconstant, varying from  $0.25$  mm. to  $1$  mm. in diameter. Both the surfaces are rough. The average thickness of the wall is  $1$  mm., the diameter of the inner cavity  $1$  to  $2$  mm. The radial tubes are of irregular outline, and show a great tendency to ramify.

(1.) *N. Poléjaeff.* L.c., 25-45.

(2.) *N. Poléjaeff.* L.c., p. 45, pl. I., fig. 7; pl. IV., fig. 1a-1d.

*Skeleton: The tubar quadriradiate spicules* are regular, their rays either tapering from the base to a sharp point, or of cylindrical form with truncated ends; in both cases the proportion between the length and the thickness of the rays at their base remaining the same 0·01, their length being 0·06 mm., their diameter 0·002 mm. These regular spicules of the radial tubes are connected by all possible intermediate stages with sagittal and irregular quadriradiate spicules supporting the inner surface. Constant as to the thickness of their rays, only near to the Osculum exceeding 0·002 mm., the gastric quadriradiate spicules vary extremely with regard to the comparative length of the rays, as well as with regard to their form and their angles. The apical rays, which in the tubar quadriradiates do not exceed the length of the facial rays, and are often still shorter, grow much longer in the gastric quadriradiate spicules, and near the Oscular part of the tube attain 0·18 mm. in length, and 0·005 mm. in diameter, the corresponding facial rays rarely exceeding the length of 0·06 mm., the lateral rays remaining of the same diameter, 0·005., the basal ray growing rather thinner.

*Skeleton of the cortex.* The triradiate and quadriradiate spicules of the cortex are regular, their rays sharp-pointed, more or less stout, the proportion between their length and thickness varying from 6·1 to 12·1. With respect to their dimensions, the quadriradiate are connected with the triradiate spicules by intermediate stages; the length of the rays of the quadriradiate reaching 1 mm., that of the rays of the triradiate not exceeding 0·6 mm. These spicules lie apart from the centripetally directed apical ray of the quadriradiate spicules, parallel to the outer surface, but the direction of the basal rays is variable.

*Skeleton of the Osculum.* The skeleton of the border of the Oscular circle consists exclusively of rectangular sagittal triradiate spicules, marked by their horn-shaped lateral rays, lying parallel to the line of the border. Their size is extremely inconstant, the length of the rays from 0·05 to 0·25 mm., and the proportion between the length and the thickness from 10·1 to 20·1. The

comparative length of the basal ray is also variable; in most cases, however, this ray is shorter and rather thinner than the lateral.

*Colour*: Yellowish-grey.

*Locality*: Station 36, April 23, 1873, off Bermuda's, depth 32 fathoms; Mud Station 186, September 8, 1874; Lat.  $10^{\circ} 30' S$ . Lon.  $142^{\circ} 18' E$ .; Cape York, Australia; depth, 8 fathoms, Coral Sand, Challenger.

#### 14. GENUS. ANAMIXILLA. Poléjaeff (1.)

The spicules in the Parenchyma irregularly disposed, more or less tangential as in the Leuconidæ. Ciliated tubes slightly branched.

#### 26. SPECIES. ANAMIXILLA TORRESII. Poléjaeff (2.)

The single specimen of *Anamixilla torresii* of the Challenger collection, presents a colony of tubular individuals; some individuals are bare-mouthed, some mouthless. The thickness of different individuals varies from 1 to 9 mm., the width of the walls is more constant, reaching 1 mm. on the average. The inner surface is slightly roughened by the protruding rays of the gastric quadriradiates, the outer surface is in a still higher degree roughened by the cortical triradiate spicules.

*Skeleton*: *Gastric quadriradiate spicules*. All rays of the same diameter, 0.02 mm.; basal ray straight, either sharply or bluntly pointed, of conical form, length varying from 0.16 to 0.4 mm., occasionally rather thicker than lateral rays, forming with each of these an angle of about  $115^{\circ}$ , lateral rays curved outwards, often highly undulating, tapering from the base to a sharp point, usual length 0.35 to 0.4 mm.; apical ray curved, sharply pointed, its length not exceeding 0.06.

*Gastral triradiate spicules*: Rays smooth, tapering from the base to sharp points, reaching 0.4 mm. in length, with a diameter of 0.015 mm.; basal ray straight, lateral rays slightly curved

(1.) *N. Poléjaeff*. L.c., p. 50.

(2.) *N. Poléjaeff*. L.c., p. 50, pl. IV., fig. 2a-2c.

inwards, each forming with basal ray an angle of about  $110^{\circ}$ ; some of them are provided with embryonic apical rays, reaching occasionally 0.2 to 0.3 mm. in length.

*Subgastric triradiate spicules*: Sagittal; lateral rays either lying in the same plane or forming with one another an angle varying from  $180^{\circ}$  to  $140^{\circ}$ ; all rays of the same diameter, varying from 0.02 to 0.05 mm.; basal ray straight tapering from the base to a sharp point reaching 0.8 mm. in length; lateral rays curved, often undulating usually half as long as basal ray, often of the same length, occasionally even longer, not exceeding however 0.8 mm. *Triradiate spicules of the Parenchyma* either quite regular, or showing a slight tendency to sagittal differentiation; rays sharply pointed maximum size about 1 mm., diameter varying from 0.1 to 0.025 mm.

*Dermal triradiate spicules*: Regular, more slender than the triradiate ones just described; rays either tapering from the base to a sharp point or of cylindrical form; average size of the rays 0.3 mm. in length by 0.02 mm. in diameter.

*Color*: Pale yellowish.

*Locality*: Torres Straits, Australia, September 7, 1874; depth 3 to 11 fathoms. Challenger.

##### 5. FAMILY. SYLLEIBIDÆ. Von Lendenfeld.

Heterocoela with a complicated exhalent canal system, connecting the sack-shaped, cylindrical ciliated chambers with the gastral cavity. The Sylleibidæ are transition-forms between Syconidæ and Leuconidæ. They can be considered as Syconidæ with an exhalent canal net, or as Leuconidæ with cylindrical sack-shaped ciliated chambers. I establish this family for *Lencetta vera* and the Genus *Lucilla* of Poléjaeff and divide it into two Subfamilies, which represent different modes of development of the Canal system and which I name after the two greatest authorities on Calci-spongiæ among the younger zoologists, Vosmaer and Poléjaeff.

## I. SUB-FAMILY. VOSMAERINÆ. Von Lendenfeld.

The ciliated chamber-tubes are all situated at the same distance from the main axis of the sponge-person and all stand radially like the simple ciliated tubes of the Syconidæ. The layer of ciliated chambers is cylindrical. A thick layer of reticulate exhalent Canals intervenes between the ciliated chambers and the gastral cavity. The inhalent canals also form a reticulation.

## 15. GENUS. VOSMÆRIA. Von Lendenfeld.

Vosmærinæ with triradiate, quadriradiate, and acerate spicules. Sensitive cells in small irregularly scattered clusters on the surface. I cannot agree with Poléjaeff in combining forms like his *Leucetta vera* and *Haeckeliana* with different ciliated chambers and a different canal system to one Genus, and I have no doubt that Poléjaeff will gladly accept an alteration on this point, according to the structure of the canal system, the importance of which he has very correctly asserted.

## 27. SPECIES. VOSMÆRIA GRACILIS. Nov. spec.

The Sponge has the outer appearance of an ordinary Syconid, is ovate or cylindrical, does not form colonies and attains a length of 25 mm. and a diameter of 12 mm. The circular, terminal small Osculum is surrounded by a frill. The gastral cavity is cylindrical, the body wall attains in the central and lower part of the Sponge a thickness of 2·5-4 mm. The ciliated chambers are of the uniform length of 1·1 mm., only towards the Osculum they are shorter. The Sponge appears hairy. The reticulation of the inhalent canals is but slightly developed, that between the ciliated chambers and the gastral cavity on the other hand attains a diameter of 2 mm. In this part of the Sponge the sexual cells are matured. The inhalent canals are narrower than the ciliated chambers. The latter possess a width of 0·14 mm. The exhalent canals are of very varying dimensions and irregular, sometimes as narrow as 0·05 mm. often attaining a diameter of 1 mm. They

open into the gastral cavity by means of distant circular pores 1.1-2 mm. in diameter. These pores are pretty regularly disposed towards the Osculum on an average 5 mm. apart. Near the base as near as 2 mm.

*Spicules*: The skeleton consists of gastric quadriradiates, triradiates of the Parenchyma (two kinds), dermal acerates and long acerates around the Osculum. *The gastric quadriradiates* are very curiously shaped. One ray protrudes into the Gasteral cavity. This centripetal ray is slightly bent upwards, conic and slightly rounded at the end, it measures 0.1 x 0.0074 mm. One of the three other rays, which are tangential, is very much longer than the other two, and points away from the Osculum. This ray measures 0.15 x 0.005, it is conic, slightly rounded at the end, and regularly curved, turning the concave side towards the Gasteral cavity or canal. The angle between this ray and the centripetal one is about 110°, with the tangential rays about 133°. The paired tangential rays measure 0.05—0.06 x 0.003 mm. These quadriradiates are met with not only in the Gasteral wall, but also in the larger exhalent canals. The further away from the stomach, the smaller the longitudinal and centripetal rays become. *Triradiates of the Parenchyma* of the two kinds. Regular ones with mostly straight cylindrical rays with rounded ends, measuring 0.1 x 0.005, and sagittal triradiates, the unpaired ray of which is situated centrifugally and longer than the other two with which it encloses angles of about 125°; it measures 0.15 x 0.005. The paired rays 0.08 x 0.004. All rays straight, conic and sharp pointed. Dermal acerates in clusters of 15-20, immersed in the Sponge one-tenth of their entire length, pointed at both ends, tapering towards the terminal end throughout the projecting part nearly vertical on the surface, measuring 1 x 0.007 mm. The clusters of these spicules are very close to one another, so that the Sponge appears hairy velvet like. The clusters are not determined in their position by the ciliated tubs below, as in *Grantessa*. The acerate spicules of the Oscular frill measure 2 x 0.0065 and taper towards the upper end. The distal half is only 0.0006 thick, very flexible and moves backward and forward like a soft thread, with the liquid in which the Sponge is immersed.

*Locality*: East Coast of Australia, Port Jackson. Von Lendenfeld.

28. SPECIES. VOSMAERIA IMPERFECTA. Von Lendenfeld.

LEUCETTA IMPERFECTA. N. Poléjaeff (1.)

This species is bare-mouthed, of tubular, elongated, cylindrical form, 35 mm. long, and 5 mm. in diameter, the thickness of the wall being 1.25 mm. that of the cortex 0.35. Both the surfaces are rather rough. The characteristic peculiarities of the species consists in the form of its pigmy triradiate, and in the presence of the parenchyma of large quadriradiate spicules, not differing either in size or in form from those of the cortex; these last are not numerous.

*Gastric quadriradiate spicules.* All more or less regular; facial rays straight, smooth, tapering from the base to approximately sharp points 0.06 mm. long, diameter varying 0.006 mm. 20.008 mm. Apical ray either straight or curved, often irregularly bent, sharply pointed; length constant, reaching 0.08 mm. *Minute quadriradiate and triradiate spicules of the Parenchyma.* Quadriradiates just of the same form and dimensions as those of the gastric surface, not numerous; triradiates still smaller, their rays rarely exceeding 0.025 mm. in length, and 0.002 mm. in diameter; some of these are regular, their straight and smooth rays tapering from the base to sharp points; but such regular triradiate forms are extremely rare; most present only two rays, forming an angle varying from  $120^{\circ}$  to  $16^{\circ}$ , the basal ray having become rudimentary, and being represented only by a small process at the crossing of the lateral rays.

*Quadriradiate spicules of the Parenchyma and cortex.* Both of the same form and the same very inconstant dimensions, the length of their rays varying from 0.3 mm. to 1 mm., and even more. Regular rays smooth, tapering from the base to sharp points, usually ten times as long as thick.

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(1.) N. Poléjaeff. Report on the Calcareo. The Zoology of the Voyage of H.M.S. Challenger. Part XIV., p. 67, Pl. VII., figs. 9a-9c.

*Dermal triradiate spicules.* Like the quadriradiates just described, regular, but more constant with respect to the proportion of the length of their rays to their thickness ; this proportion varies from 10/1 to 16/1. Rays smooth, of conical or cylindrical form, bluntly pointed, average length 0·6 mm.

*Locality* : Station 163A, 1874 ; off Port Jackson, Australia ; depth, 30 to 35 fathoms, rock. Challenger.

29. SPECIES. VOSMAERIA HAECKELIANA. Von Lendenfeld.

LEUCETTA HAECKELIANA. N. Poléjaeff (1).

The largest specimen reaches 65 mm., in length with a maximum diameter of 10. ; the walls are 2·5 mm., thick, the cortex strongly developed. The outer surface is smooth, the inner slightly rough. Gastric and parenchymal quadriradiate spicules : either regular or sagittal, the lateral rays becoming more or less curved, or even irregular, all rays instead of being straight becoming irregularly bent and of different lengths ; all rays of the same average diameter 0·005 mm., tapering from base to sharp points ; facial rays 0·02 mm., to 0·08 mm. The gastric radiate spicules follow the course of the exhalent canals throughout their whole length, and their presence or absence on the surface of the cavities of the parenchyma intimates whether we have to do with an exhalent or inhalent canal.

*Dermal quadriradiate spicules* : Extraordinarily rare ; regular ; all rays of the same length not exceeding 0·75 mm., by 0·075 mm., smooth tapering from the base to sharp points.

*Dermal triradiate spicules* : Regular, rays of a rather cylindrical form, 0·55 mm., long, 0·03 mm., in diameter, lying in the cortex in several parallel layers, becoming smaller in the low collar and sagittally differentiated, the angles between basal and lateral rays becoming more acute, 120°-95°, and the lateral rays themselves, like those in the Oscular triradiate spicules of *Leucetta vera* becoming horn-shaped.

*Locality* : Station 163A, June 3, 1874, off Port Jackson, Australia ; depth, 30 to 35 fathoms, rock. Challenger.

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(1.) N. Poléjaeff. L.c., p. 69, Pl. II., fig. 6 ; Pl. VIII., figs. 1-6.

## II. SUBFAMILY POLEJNÆ. Von Lendenfeld.

The ciliated chambers (tubes) vertical on the exhalant canals, disposed therefore radially around the canals and not equi-distant from the axis of the Sponge, the chamber layer not a simple cylinder but extensively folded.

## 16. GENUS. POLEJNA. Von Lendenfeld.

The spicules of the Parenchyma resemble Amphoriscus inasmuch as the centripetal rays of the dermal layer lie parallel with and meet the centrifugal rays of the gastral layer. Poléjaeff (1) has adopted Haeckel's name *Leucilla* for these Sponges. As the meaning which he gives to it however is totally different from that, which Haeckel associated with the word *Leucilla*, and as I retain the Genus *Leucilla* in the true sense of Haeckel I fancy myself justified in establishing this new name, which like the term *Polejnæ* is derived from the name of the author of the Challenger-Calcareas.

## 30. SPECIES. POLEJNA UTER. Von Lendenfeld.

## LEUCILLA UTER. N. Poléjaeff (2.)

The external form of this Sponge is variable; mostly of tubular elongated form, growing narrower towards both ends, attaining a length of 100 mm. and a maximum diameter of 13 mm. The walls are 2 mm. thick.

*Gastric quadriradiate spicules* sagittal. All rays of the same diameter, 0.02 mm. on an average, more or less sharply pointed, basal ray straight, length inconstant, varying from 0.25 to 0.35 mm., forming with each of the lateral rays an angle of about  $110^\circ$ ; lateral rays curved outwards, reaching a length of 0.7 mm.; apical ray curved, half as long as lateral rays. Towards the osculum these quadriradiate spicules grow smaller, lateral rays 0.3 mm. long, with a diameter of 0.0125 mm., the concave lateral rays becoming straight and convex.

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(1.) *N. Poléjaeff*. Report on the Calcareas. The Zoologie of the Voyage of H.M.S. Challenger. Part XXIV, f p. 51.

(2.) *N. Poléjaeff*. L.c., p. 53, Pl. VI., figs. 2a-2f.

*Subgastric triradiate spicules* sagittal. All rays sharp pointed and of the same diameter, the proportion between their length and thickness varying from 12·1 to 20·1; length inconstant, not exceeding, however, 0·6 mm. in basal, and 0·42 mm. in lateral rays; some are provided with a rudimentary fourth apical ray.

*Quadriradiate spicules of the parenchyma and dermis*: All rays of the same diameter, rarely exceeding 0·05 mm.; facial rays usually of the same length, varying from 0·4 (rarely shorter) to 0·6 mm.; basal ray straight, tapering from an approximately sharp point, forming with each of the lateral rays an angle of 105° to 110°; lateral rays either straight or slightly curved inwards, sharp pointed; apical ray straight, tapering from the base to a sharp point, never projecting from the inner surface, length varying from 0·4 to 1·2 mm.

*Dermal acerate spicules* straight, fine, linear, sharp pointed, surface smooth, length not exceeding 0·4 mm., with a diameter of 0·0025 mm.; not numerous, projecting from the outer surface.

*Locality*: Station 36, April 23, 1873; off Bermudas; depth, 32 fathoms. Station 209, January 22, 1875; Lat. 10° 10' N., Long. 123° 55' E. Philippine Islands; depths, 95 to 100 fathoms Challenger. Torres Straits, Von Lendenfeld. Macleay-Museum.

## 6. FAMILY. LEUCONIDÆ. Von Lendenfeld.

Heterocoelia with ramified inhalent and exhalent canals with spherical ciliated chambers. The outer surface is not differentiated into two different parts. This family comprises the Leucones of Haeckel (1), with spherical chambers with the exception of the Teichonidæ.

## 17. GENUS. LEUCETTA. Von Lendenfeld.

Leuconidæ with triradiate spicules exclusively. This Genus is nearly identical with Haeckel's (2) *Leucetta*.

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(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 113.

(2.) *E. Haeckel*. L.c. Band II., Seite 116.

31. SPECIES. *LEUCETTA MICRORHAPHIS*. Von Lendenfeld.*LEUCETTA PRIMIGENIA* var. *MICRORHAPHIS*. Haeckel(1.)*LEUCETTA PRIMIGENIA* var. *MICRORHAPHIS*. Ridley (2.)

Both surfaces smooth. Triradiates regular. Rays straight, pointed. Numerous small spicules measuring  $0.742 \times 0.011$ , and rarer large ones of a similar shape measuring  $0.8 \times 0.085$ , very rare spicules of an intermediate size are also met with. I have many specimens of Haeckel's *Leucetta primigenia*, they are all slightly ramified; 3-6 cylindrical pieces with uneven surface grown together and meeting at sharp angles. These cylinders taper towards the dermal osculum and attain a length of 25 and a diameter of 8 mm. The gastral cavity is large. The body wall not exceeding 2 mm. in thickness.

The inhalent pores are covered by a thin perforated membrane as in other Sponges (*Aplysillidæ*) and lead into wide bulbous extensions from the proximal end of which the inhalent canals take their origin. A great number of Canals radiate from each subdermal lacune. The latter have a diameter of 0.12 mm. In the surface the small spicules are situated very regularly and tangentially disposed in such a manner that they form a network with hexagonal meshes. The pores are situated in the meshes, but there is not a pore to each mesh.

The spiculation of all these specimens is the same—as above—corresponding to Haeckel's var. *microhaphis* of *Leucetta primigenia*. Ridley (l.c.) has obtained the same sponge from Torres Straits. The similarity in the structure of my specimen led me to assume that this variety of Haeckel's should be considered as a species.

*Locality*: Australia? Haeckel; North Coast of Australia, Torres Straits. Alert; East Coast of Australia, Port Jackson, Von Lendenfeld; South Coast of Australia, Port Phillip V. Lendenfeld.

(1.) *E. Haeckel*. L.c. Band II., Seite 119; Band III., Taf. 21. Figs. 10-17.

(2.) *Stuart O. Ridley*. Report on the Sponges. Report on the Zoological Collections made in the Indian and Pacific Ocean, during the Voyage of H.M.S. Alert, 1881-82. British Museum Catalogue, 1884, p. 482.

32. SPECIES, LEUCETTA DURA. Von Lendenfeld.  
LEUCONIA DURA. Poléjaeff (1).

Irregular colonial or solitary Sponges with or without a frill round the Osculum. Gastral cavity small. Besides the regular spicules of large and small size there are irregular and sagittal Triradiates. The latter are amassed around the Oscula.

*Locality*: Bermudas, North Coast of Australia, Torres Straits Challenger.

33. SPECIES. LEUCETTA PANDORA. Haeckel (2.)

A solitary Sponge, without frill round the osculum. Spherical or ovate often with a short peduncle. They are 12 to 15 mm. long and have a diameter of 8 to 12 mm. The Gastral wall is very thin, measuring only 1.1-1.5 mm. in thickness. Dermal and Gastral surface smooth. Triradiates very variable in size and shape, in greater part or throughout irregular, with bent unequal rays. Rarely acerate, and quadriradiate spicules are met with, so that E. Haeckel establishes three connective varieties of this species: *Leucaltis pandora*, *Leucortis pandora*, *Leucandra pandora*. The spicules contain, according to Haeckel (3) more organic substance in proportion than those of other *Leucetta* species. The mean size of the rays is 0.3—0.6 x 0.0005—0.005.

*Locality*: South Coast of Australia, Bass' Straits, Wendt; St. Vincent's Gulf, Schomburgh.

34. SPECIES. LEUCETTA CLATHRATA. Carter (4.)

A cake-like Sponge, consisting of a plate-like basal extension, which bears curved cylindrical extensions on the upper surface, the latter appearing on relief. Triradiates of two kinds, small ordinary regular ones in great abundance with rays measuring

(1.) *N. Poléjaeff*. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 65, pl. II., fig. 3; pl. VII., figs. 7a-7a<sup>m</sup>.

(2.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 127., Bd. III., Taf. XXII., figs. 3a-3c.

(3.) *E. Haeckel*. L.c. Band II., Seite 129.

(4.) *H. T. Carter*. Annals and Magazin of Natural History 23; series. Vol. XI., nr. 61, p. 33, pl. I., figs. 13-17.

0.08 x 0.011, and larger pyramidal ones the rays of which are curved S shaped. The proximal ends are turned towards the axis and the distal ends away from it, so that the whole represents a tripod (l.c., fig. 16.) Their rays measure 0.13 x 0.04. The dome-shaped central part underlies the surface of the Sponge, the rays point centripetally.

*Locality* : South-west Coast of Australia. Carter.

#### 18. GENUS. LEUCALTIS. Von Lendenfeld.

Leuconidæ, with triradiate and quadriradiate, but without acerate spicules. This genus is nearly identical with Haeckel's (1) genus Leucaltis.

#### 35. SPECIES. LEUCALTIS HELENA. Nov. spec.

Oval, elongate or cylindrical, solitary Sponges attaining a length of 25 and diameter of 15 mm., with circular transverse section. No frill to the Osculum. Gastral and dermal surface smooth. Gastral cavity large ovate. Thickness of the body wall 2 mm. The inhalent pores lead into large cylindrical canals, which are 0.2 mm. wide, and extend longitudinally just below the surface. From these tangential subdermal Lacune-canals, tubes originate which extend, more or less regularly, radially in a centripetal direction towards the Gastral cavity. Below the Gastral surface, which is perforated by distant circular pores, with from 0.5—1.5 mm. diameter, likewise longitudinal lacunose canals extend, which are very irregular and have an average diameter of 0.4 mm. From these, radial tubes, extending centrifugally originate. Between these and the inhalent tubes described above, there is one layer of spherical ciliated chambers which measure 0.1 mm. The canal system is like that of *Aplysilla*. When the canal system of a greater number of species will be better known it will afford characters for the establishment of classificatory categories.

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(1.) *E. Haeckel*. L.c. Band II., Seite 142.

*Spicules*; A dense felt-like layer of Triradiates and Quadri-radiates with one very short ray clothing the Gastral cavity. The rays of these spicules measure on an average  $0.1 \times 0.01$  mm. Rare regular triradiates in the Parenchyma with straight conic rays measuring  $0.28 \times 0.03$  mm. Very numerous sagittal quadri-radiates, the sagittal ray mostly pointing towards the interior of the Parenchyma. Sagittal ray straight, conic and pointed  $0.42 \times 0.056$ . The three basal rays alike with equal angles between them, straight, conic and pointed  $0.35 \times 0.042$  mm. Dermal quadri-radiates sagittal. Differentiated ray centripetal, straight, conic and pointed  $0.57 \times 0.05-0.06$ , always exactly radial. Tangential rays curved in the proximal, and straight in the distal part; conic and pointed, all equal and regularly disposed convex towards the outer side  $0.28 \times 0.033-0.04$ .

*Locality*: East Coast of Australia, Port Jackson. Von Lendenfeld.

36. SPECIES. LEUCALTIS PUMILA. Haeckel (1.)

LEUCONIA PUMILA. Bowerbank (2.)

LEUCONIA PUMILA. Gray (3.)

DYSSYCONELLA PUMILA. Haeckel (4.)

This Sponge does not appear to form colonies. It is always solitary spindle-shaped, ovate or cylindrical, with or without Osculum, which may be sessile or on the termination of a long proboscis. Sponge 10 to 20 mm. long and 3-7 mm. in diameter. Gastral cavity cylindrical. Body wall of uniform thickness 1 to 2 mm. The regularly disposed Gastral pores have a diameter of  $0.3-0.6$  mm. The exhalent canals form a lacunose reticulation composed of relative narrow tubes. All the Australian specimens examined by Haeckel, possess a proboscis.

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(1.) *E. Haeckel*. L.c. Band II., Seite 148., Band III., Taf. XXVII., figs. 2a-2g.

(2.) *T. S. Bowerbank*. Monograph of the British Spongiadae. Vol. II., p. 41.

(3.) *F. Gray*. Proceedings of the Zoological Society of London, 1867, p. 556.

(4.) *E. Haeckel*. Prodrömms eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Wissenschaft. Band V., Heft II., Seite 242.

*Skeleton*: The main skeleton is formed out of larger and smaller, slender triradiate spicules. The large Triradiates are mostly sagittal. The rays of which are slender, conic, mostly straight, or slightly bent, 0·6—0·9 mm., rarely 1—1·2 mm., long and only 0·03—0·05 mm., rarely 0·06—0·08 mm., thick. The smaller triradiate spicules, which are more numerous than the large one, are irregularly scattered, and fill up the space between the former, they are mostly sagittal or irregular. Their rays are sometimes straight, or more or less, often strongly bent, on an average of 0·2—0·3 mm. in length, and 0·01—0·02 mm. in thickness. Triradiate spicules very variable.

The Gastral surface and the inner surface of the larger wall canals is clothed by a dense layer of middle-sized sagittal quadriradiate spicules. These are regular, parallel disposed, the basal ray is bent aboral downwards, or in the canals, outwards, if straight 0·25—0·35 mm. long. Both the lateral rays are slightly curved, and a little shorter, only 0·15—0·3 mm. long. The angles vary greatly, once nearly equal, once strongly differentiated. The unpaired angle increases from 120°, 150°, and to 160°, 180° in the proboscis.

Accordingly the paired angles decrease from 120° to 105° and to 90°. Round the mouth there are only rectangular quadriradiate spicules. The apical ray varies greatly, mostly very short, only 0·05—0·15 mm. long, slightly bent to the oral side. All rays are at the base 0·01—0·02 mm. thick.

*Locality*: Atlantic Ocean, Norman's Islands; Guernsey, Norman; Coast of Mexico; Mogados, Haeckel; Cape of Good Hope, Wilhelm Bleek; Indian Ocean, Bass Straits, Wendt.

37. SPECIES. LEUCALTIS BATHYBIA Haeckel (1).

GRANTIA ARABICA. Miklouho (2).

LEUCALTIS BATHYBIA var. AUSTRALIS. Ridley (3).

Solitary Sponge, of a cylindrical or ovate rather irregular shape. The specimen of Haeckel measured 8 to 16 mm., in length 4 to 6

(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 156, pl. XXVIII., figs. 2a-2e.

(2.) *N. M. Maclay*. Manuscript.

(3.) *Stuart O. Ridley*. Report on the Sponges. Report on the Zoological Collections made in the Indian and Pacific Ocean, during the Voyage of H.M.S. Alert, 1881-1882. British Museum Catalogue, 1884.

mm., in thickness. The cylindrical Gastral cavity is covered with small pores, rather narrow. The body-wall measures  $1-1\frac{1}{2}$  mm. in thickness.

*Skeleton.* Most of the spicules are Quadriradiates of middling size. These are covered by a clothing of Triradiates. The latter form a dense dermal layer. The Quadriradiates are mostly sagittal or irregular. Their rays measure  $0.3-0.6 \times 0.03-0.05$ . The dermal Quadriradiates are situated as in *Leucaltis Helena*: three rays in the surface tangential; the fourth radial, pointing centripetally. The tangential rays of these spicules are sagittal in themselves, the unpaired angle measuring  $150-180^\circ$ .

The Triradiates are irregular, the mean measurement of their rays is  $0.15-0.3 \times 0.008-0.015$ . The inner layer is formed by Triradiates and Quadriradiates.

The principal difference between this species and *Leucaltis Helena* lies in the distribution of the Triradiates, which in the latter do not form sheaths around the parenchymal Quadriradiates. Ridley (l.c.) has established the variety *Leucaltis bathybia* var. *australis* for a slightly aberrant form obtained by the Alert. He describes his variety as follows:—A small low marine specimen, with a small lateral unarmed vent and very reduced cloacal cavity. The Quadriradiates are sagittal, those of the outer surface very large. Diameter of rays about 0.04 mm. The facial angle nearly  $180^\circ$ , the apical ray in the same plane as the laterals. The deep Quadriradiates have a somewhat smaller facial angle and more slender rays and the apical ray often projects well forward. Rays almost straight. The Triradiates form a thin layer on the inner wall where their rays measure only about 0.01 mm., in diameter, they have a facial angle of about  $160^\circ$ , in the deep parts they are subregular, sparsely scattered amongst the Quadriradiates and the ray measure about 0.02 sometimes 0.025 in diameter, rays approse straight:

*Colour*: White.

The main feature of this variety lies in the large size of the profound Triradiates, and in the massive form of the Sponge.

*Locality*: Red Sea, Perim, Siemens, Djeddah, Miklouho-Maclar; East Coast of Australia, Port Jackson, Alert.

## 19. GENUS. LEUCORTIS. Von Lendenfeld.

Leuconidæ with acerate and triradiate spicules. This genus is nearly identical with Haeckel's Genus *Leucortis*.

## 38. SPECIES. LEUCORTIS LORICATA. Von Lendenfeld.

## LEUCONIA LORICATA. N. Poléjaeff (1.)

This species represented by a single specimen, 30 mm. long and 8 mm. broad, possesses a strongly developed cortex 0.5 mm. thick, the width of the whole wall being 2 mm. consisting of several parallel layers of sagittal triradiate spicules; a quite irregular disposition of the Parenchymal spicules, only those which are near the inner surface lying more or less parallel to it; minute spined acerate spicules scattered everywhere in the body, but chiefly coating the inner surface. The structure of the canal system presents no deviations from the general type.

Spined acerate spicules 0.025 mm. x 0.002 mm. Numerous on the inner surface, they are very rare in the Parenchyma and in the cortex. Triradiate spicules of the Parenchyma, either quite regular or rather sagittal and irregular; rays straight, tapering from the base to sharp points; surface more or less smooth; the proportion between the length and thickness 8.1, the length 0.6—1 mm.

Cortical triradiate spicules, sagittal, all rays lying in the same plane, tapering from the base to a more or less rounded end, usually of the same thickness, the proportion between this latter and the length varying from 10.1 to 16.1; basal ray straight, sometimes rather thinner than lateral rays forming with each of these latter an angle of 115°, lateral rays either straight or slightly curved forwards, 0.325—0.5 mm. long, usually somewhat shorter than basal ray, often of the same length, sometimes even rather longer. In the wall of the collar these triradiate spicules become smaller, their rays being rarely longer than 0.15 mm., with a diameter of 0.0125 mm., and show a regular disposition.

(1.) N. Poléjaeff. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 63, pl. II., fig. 2; pl. VII., figs. 6a.-6b.

their basal ray being directed towards the closed end of the animal.

Stout acerate spicules, sparsely scattered in the wall perpendicularly to the outer surface, often projecting from it; spindle-shaped, tapering from the centre to a sharp point at each side, either straight or slightly curved; rarely exceeding 0.75 mm. in length and 0.07 mm. in diameter.

Slender acerate spicules of the same shape and disposed similarly to the last mentioned form, rarely longer than 0.3 mm. with a diameter of 0.0025 mm.

Acerate spicules of the collar straight or curved, either sharply or bluntly pointed, 0.5—1 x 0.018 mm.

*Locality*: East Coast of Australia. Station 163A, June 3, 1874, off Port Jackson; depth 30 to 35 fathoms; rock.

39. SPECIES. LEUCORTIS PULVINAR. E. Haeckel (1.)

SYCOLEPSIS PULVINAR. E. Haeckel (2.)

MLEA DOHRNI. N. Miklouho (3.)

LEUCORTIS PULVINAR VAR. INDICA. E. Haeckel (4.)

This species forms, in the adult stage, solitary persons or colonies, with or without mouth-opening. The latter is always simple and naked. The canal-system is always very narrow and especially the Gastral cavity of a very small extension.

In the lipostome forms the latter coalesces entirely, so that the whole Sponge gets the appearance, in a transverse section, for the naked eye of quite massive heap, without any visible cavity. The Parenchyma firm. The solitary form mostly appears as a conic, oval or roundish, rather irregular mass, which has no peduncle. Its diameter is mostly 5 to 10, rarely 15 to 20 mm. A longitudinal section shows that the Gastral cavity is very narrow, rarely exceeding 1 or 1.5 mm. in diameter. The colonial specimen forms very irregular roundish colonies of a bulbous or

(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 162., Band III., pl. XXIX.

(2.) *E. Haeckel*. Prodröm eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1870; Band V., Heft II., Seite 251.

(3.) *N. Miklouho-Malay*. Manuscript.

(4.) *E. Haeckel*. L.c. Band II., Seite 163.

rough shape, which are mostly composed of only 2 to 5, rarely of 6 to 12 persons. These colonies resemble small potatoe-bulbs and have a diameter of 10 to 20 mm. rarely 30 to 40. Sometimes they form flat cushions covered with excrescences. At the top of each knob generally a small Osculum is met with, 0.5 to 1.5 mm. in diameter, which leads into a similar narrow Gastral cavity. Sometimes there is no trace of an Osculum, sometimes several persons in a colony possess only one Osculum, or there is only one single Osculum for all the persons in the colony. Dermal and Gastral surface bare. The main mass of the skeleton consists out of middle sized triradiate spicules, between which there are enormous Ascerates. These are on an average 5 to 10 times as long and thick as the rays of the triradiate spicules. The Dermal and the Gastral surfaces contain sagittal triradiate spicules, the lateral rays of which are as long but only half as thick as the rays of the subregular or irregular triradiate spicules of the outer layer of the Parenchyma. The Australian specimen belongs to Haeckel's *Leucortis pulvinar* var. *indica*. The spicules contain a very large proportion of organic matter, therefore they are more flexible, the triradiate spicules of the Parenchyma mostly irregular.

*Locality*: Indian Ocean, Schneehagen; West Coast of Australia, Harvey; Ceylon; Wright. Red Sea, Frauenfeld, Miklouho.

## 20. GENUS. LEUCANDRA. Von Lendenfeld.

Leuconidæ with acerate, triradiate and quadriradiate spicules. Nearly identical with Haeckel's (1) genus *Leucandra*.

### 40. SPECIES. LEUCANDRA ALCICORNIS. E. Haeckel (2).

The solitary person, which possess an Osculum sometimes, sometimes none, is a slender cylinder measuring from 10 to 20 x 3 to 5 mm. The most common colonial form is a bushy scrub,

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(1.) *E. Haeckel*. L.c. Band II., Seite, 170.

(2.) *E. Haeckel*. L.c. Band II., Seite 184; Band III., Taf. XXXII., figs. 4a-4h; Taf. XXXVII., figs. 3 A., 3 B., 4.

with dichotomous branches, every terminal branch with a simple naked Osculum. The branches form sometime anastomoses. The Sponge represents in outer appearance the coral *Cladocora caespitosa*, and forms an elongate cushion measuring 40—70 x 30—50 x 20—40 mm. The number of persons forming a colony is great (sometimes several hundred). The Australian specimens, which are slightly branched, each branch measures 30 to 50 mm., and more, in length, and 3-6 mm., in thickness. The bare Oscula have only a diameter of  $\frac{1}{2}$  to 1 mm. All persons are curved, the concave side towards the interior of the colony.

*Skeleton.* The main mass is formed by middle-sized triradiate spicules. The rays are at an average 0.2 to 0.4 x 0.012 to 0.02 mm., subregular or sagittal. The rays are slender, mostly slightly, often much curved, rarely quite straight. In the sagittal triradiate spicules both the lateral rays more curved, the basal ray straight and at the end inflated. On the inner surface of the large canals there are many sagittal quadriradiate spicules of the same shape and size. Apical ray is only short, 0.05 mm. Characteristic of this species is the armor-like cortex of the outer surface, which consists of one or more layers of the very large acerates. These are spindle-shaped, either tapering equally towards both ends, or thicker in the outer portion, sometimes inflated. They are slightly curved, seldom quite straight, 1 to 3 x 0.07 to 0.1 mm. All acerate spicules are situated parallel in the dermal surface and extend longitudinally. The interstices of acerate spicules are filled up with sagittal triradiate spicules, of which the basal-ray is parallel to the longitudinal ones of the acerate spicules and pointing downwards. The outer surface sometimes quite smooth and bare, sometimes velvet-like, as everywhere a mass of very fine bristly acerate spicules stand vertically on it. These spicules are 0.1—0.3 x 0.001 mm.

41. SPECIES. *LEUCANDRA CONICA*. Nov. Spec.

A small solitary, irregular, more or less cylindrical Sponge with an Osculum, which bears a small hardly perceptible fringe of spicules but appears naked. Outer and inner surface are pretty

smooth. The Sponge attains a length of 30 and a diameter of 12 mm. The Gastral cavity is cylindrical and rather narrow, measuring only a third of the diameter of the Sponge across. The thick body wall is lacunar; wide canals measuring from 0.2—0.25 mm. in diameter, and with a circular transverse section, traverse it in every direction. Below the outer surface we meet with extension, communicating sub-dermal cavities, from which comparatively narrow canals take their origin, which can be traced in a centripetal direction for some distance. The circular Canals mentioned above belong to the exhalent canal system, and are connected with the Gastral cavity by very wide (0.4 mm.) and irregular tubes, which do not stand vertical in the Gastral wall, but extend upwards towards the Osculum. The pores in the Gastral wall at their terminations are scattered sparsely, and measure on an average 0.5 mm. across. The ciliated chambers have a diameter of 0.06 mm.

*Spicules*: The skeleton consists mainly of triradiates in the Parenchyma. The Gastral quadriradiates are small and irregularly scattered; the rays and angles are all different. The rays vary from 0.028—0.08 x 0.004—0.007. The Parenchymal Triradiates are very regular; sometimes the rays are slightly bent; they are conic and blunt and measure 0.35 x 0.01. Acerates of the Parenchyma, more or less radially disposed, pointed at both ends, slightly protruding beyond the surface, spindle-shaped, and measuring 1.5 and 0.035 mm., rather rare. Minute Acerates in a continuous layer in the outer surface all parallel and situated radially, measuring 0.08 x 0.002. These spicules are rounded at the proximal, and pointed sharply at the distal end. Although forming a continuous layer, they nevertheless do not produce a dense and hard outer skin as in those Sponges which possess a "Stäbchen-Mörtel." Acerates forming the frill named the Osculum of the same appearance as the former, measuring 0.3—0.5 x 0.002 often slightly bent. Thickest towards the proximal rounded end, and tapering from there to the distal end, which is mostly broken off in specimens.

*Locality*: East Coast of Australia, Port Jackson, Laminarian zone. Von Lendenfeld.

## 42. SPECIES. LEUCANDRA MEANDRINA. Nov. spec.

A solitary cylindrical and tube-shaped Sponge attaining a length of 120 and a diameter of 25 mm. The dermal surface is smooth, without projecting spicule rays, the Gastral surface and also that of the larger exhalent canals appears hairy or velvet-like. The outer surface is very uneven, and has the appearance of a surface with an intricate meänder-like sculpture on it, in high relief. The Gastral cavity is cylindrical and the thickness of the body wall is very different in different parts in consequence of the above-mentioned surface-sculpture. The canal system is rather peculiar: there are no lacunose extensions of the inhalent canals, no subdermal cavities. In the Gastral part of the body wall we meet with very regular longitudinal canals of an oval transverse section. The short axis of the Ellipse is situated radially. The thickness of the body wall is 1.8—2.1 mm., the Gastral cavity is accordingly very large. The longitudinal canals measure on an average  $0.7 \times 1.2$  mm. These exhalent wide collecting canals open separately into the Gastral cavity, without forming anastomoses or lacunes. The remarkable gastric quadriradiate spicules clothe these canals in the same way as the Gastral cavity itself, so that they make rather the impression of branches of a ramified Gastral cavity than of exhalent canals.

*Spicules*: The skeleton consists of gastric quadriradiate spicules with a very elongated, protruding centripetal ray, Parenchymal triradiates of two kinds and Parenchymal, radially situated and slightly protruding large acerate spicules. The gastric quadriradiates are sagittal and regular. The centripetal ray measures from 0.07 to 0.28 mm. in length, the longer ones are predominating with a very constant basal thickness of 0.005 mm. The tangential rays lie in one plane which is vertical to the centripetal ray. Their rays are equal and also the angles, like the centripetal ray quite straight or slightly and irregularly curved at the distal end. They measure  $0.18 \times 0.005$  mm. All rays are cylindrical and pointed. The Triradiates of the Parenchyma are regular or slightly irregular, never sagittal and stout or slender. The stout

ones predominate throughout. The slender ones are more numerous towards the outer surface. The rays of the stout spicules measure  $0.28 \times 0.021$ , those of the slender ones have the same length, but are only  $0.07$  mm. thick. Among the Triradiates there are also a few small Quadriradiates with spicules corresponding to those of the slender triradiate spicules. Transition forms between these Quadriradiates and the slender Triradiates are present in great abundance. Transition forms between the slender and the stout triradiate spicules do not exist.

The acerate spicules are spindle-shaped and pointed at both ends. They measure  $1.5$  mm.  $\times$   $0.035$  mm. These are rare. Around the Osculum there are no differentiated spicules.

*Locality*: East Coast of Australia, Port Jackson, 10-20 fathoms. Von Lendenfeld.

43. SPECIES. LEUCANDRA CATAPHRACTA. E. Haeckel (1).

This Sponge consists of solitary persons of an elongate cylindrical or flattened shape, they are slightly spindle-shaped, a narrow peduncle and narrow oscular part are generally met with. These cylinders attain a length of 20 to 30 mm., by a diameter of 6 mm. The Gastral cavity is narrow only  $\frac{1}{5}$  to  $\frac{1}{4}$  of the diameter of the outer cylindrical surface. Osculum present without frill. On the surface of the stomach there open a great number of very fine Gastral pores, which lead into minute perietal-canals. On a longitudinal section through the wall these latter are hardly visible.

*Skeleton*: The main mass of the skeleton is in this species, quite different from all the others, formed by several layers of longitudinal enormous acerate spicules, which lie parallel to the dermal surface. They are coated and united by a cement, which consists of small, mostly sagittal triradiate spicules. The large acerate spicules are spindle-shaped, either tapering to both ends, or inflated on the oral side, mostly slightly curved, rarely straight, 1 to 3 mm.,  $0.15$  to  $0.2$  mm. All Acerates lie in a longitu-

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(1.) *E. Haeckel*. L.c. B and II. Seite 203., Band III., Taf. XXXII., figs. 6a-6f; Taf. XXXVII., fig. 2.

dinal direction, parallel to the longitudinal axis of the body, but pointing a little outwards with the oral end. They are situated in several parallel layers closely backed (10 to 15 layers at the thickest place in the body-wall). The small interstice between the Acerates are filled up by small Triradiates, which surround sheath-like the inner Acerates. Most of them are sagittal and are with their basal ray parallel to the longitudinal axis of the body, whilst both the lateral rays diverge to the oral side, and often embrace the acerate spicules by their more or less curvity. The unpaired angle  $150^{\circ}$  to  $170^{\circ}$ , both the paired ones  $95$  to  $105^{\circ}$ . The straight basal ray measures 0.15 to 0.2 in length. Their basal thickness 0.005 to 0.008 mm. Between the sagittal rays there are also single irregular, rarely regular triradiate spicules. The sagittal quadriradiate spicules which coat the whole inner surface of the Gastral cavity, and the larger canals, and which are arranged regularly, the basal ray towards the aboral side, possess an unpaired angle of  $160$  to  $170^{\circ}$ , the two paired angles  $100$  to  $95^{\circ}$ . Their basal ray is to 0.35 mm., long, straight, their slightly curved lateral rays 0.2 to 0.3 mm., and like the basal ray only 0.005 mm., thick. But the apical ray is 2 to 6 times thicker, that is 0.01—0.02 or 0.03 mm., in thickness. It is very varying, in the greater part of the Gastral cavity only 0.1—0.15, but towards the Osculum 0.3—0.4 mm., long. The entrance to the Gastral cavity is in this way hindered by a terrible circle of strong apical rays just below the Osculum.

*Locality*: East Coast of Australia, Port Jackson, Frauenfeld; Port Denison, Von Lendenfeld.

44. SPECIES. LEUCANDRA TYPICA. Von Lendenfeld.

LEUCONIA TYPICA. var. tuba. N. Poléjaeff (1.)

This Sponge attains a length of 40 mm. and an average diameter of 12 mm., the thickness of the body wall is 3 mm. The round flagellated chambers in this species have particularly regular outlines, and are smaller than in any other case, their diameter rarely exceeding 0.04 mm.

(1.) *N. Poléjaeff*. Report on the Calcareous. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 56, pl. VII., figs. 2a-2c.

*Gastric Quadriradiate spicules.* Basal ray straight, tapering from the base to a sharp point usually shorter, 0.18 mm., and rather thinner than lateral rays, forming with each of these latter an angle varying from  $105^{\circ}$  to  $110^{\circ}$ ; lateral rays more or less cylindrical, either straight or slightly curved forwards, rarely exceeding 0.225 mm. in length, with a diameter of 0.015 mm.; apical ray curved, more or less sharply pointed, length not exceeding 0.06 mm. The length of the apical ray, however, is variable, and there are amongst the quadriradiate spicules many triradiate spicules also. *Triradiate spicules of the Parenchyma.* Most quite regular, rays straight, smooth, tapering from the base to sharp points, reaching 0.75 mm. in length and 0.065 mm. in diameter.

*Dermal Triradiate spicules.* Sagittal, all rays of the same length, rarely exceeding 0.35 mm., and of the same diameter, 0.02 mm., either tapering from the base to sharp points or of a more cylindrical form; basal ray straight, lateral rays curved forwards, forming each with basal ray an angle of about  $115^{\circ}$ .

*Acerate spicules.* In the walls of the body, sparsely scattered here and there in the Parenchyma, either isolated or in groups, fine linear, straight, occasionally slightly curved, reaching 0.3 mm.; near the Osculum piercing the wall in perpendicular direction, either spindle-shaped or rather cylindrical, but sharp pointed, straight or slightly curved, 0.1 mm. long, 0.304 mm. in diameter.

*Locality:* Station 36, April 23, 1873; off Bermudas, 32 fathoms, mud. East Coast of Australia, Port Jackson. Von Lendenfeld.

45. SPECIES LEUCANDRA VILLOSA. Nov. spec.

This Sponge appears in the shape of the very large thin-walled and irregular sacs with an extremely wide Osculum. These sacs, of an irregular cylindrical or oval shape, attain a length of 50 and width of 25 mm. and more. They generally appear compressed, with an oval transverse section, the large axis of the ellipse about twice as long as the small one. The Osculum is

nearly as wide as the body. Narrower in the oval Sponges it is relatively much wider in the cylindrical specimens. The body wall is only 2-4 mm. thick, so that the Gastral cavity appears very roomy. The Osculum is destitute of a frill. Our Sponge seems always to be solitary. The outer surface is covered by dense hair protruding a good distance and consequently makes the impression of a thick fur. The inner surface is slightly rough. The cana system, in different parts of the Sponge near the Osculum, extremely simple, no lacunes or anastomoses of any kind are formed. The body wall is consequently very thin in this part 2 mm. Further down towards the aboral pole we find the Gastral wall perforated by large, densely scattered round holes measuring 1.5-2.5 mm. in diameter. These exhalent pores lead into longitudinal canals of an oval, transverse section similar to those described in a very different species, *Leucandra meandrina* by myself. The pores or rather short radial canals connecting the longitudinal tubes with Gastral cavity are conic or trumpet-shaped, wide at the mouth, they open with an aperture not exceeding 0.5 mm. in diameter into the tubes. These longitudinal tubes are clothed with the same skeleton as the stomach.

*Spicules: Gastric Quadriradiate spicules.* Centripetal, sagittally differentiated ray, straight, slender, and protruding into the tubes and Gastral cavity. This ray is cylindrical and pointed, rarely slightly curved towards the end, measuring 0.2—0.55 mm. x 0.01 mm. Three tangential rays equal, in a plane vertical to the centripetal ray, straight, conic and pointed with equal angles between them. These rays measure 0.28 x 0.01 mm. *Triradiates and Quadriradiates of the Parenchyma.* Regular *Triradiates* with straight conic and rounded rays, measuring 0.35 x 0.02 mm. are predominant in the body wall. Besides there are *triradiates* of a similar size as the former with curved rays and more or less irregular angles. I have never met with proper sagittal *Triradiates*. On these irregular spicules and also on a few regular ones an incipient fourth ray can be observed. These forms lead up to *Quadriradiates* with conic, curved and terminally rounded rays measuring 0.3 x 0.018 mm. which are however

rare. The dermal Acerates are of two kinds; very slender linear spicules and larger but also slender and very long spindle-shaped spicules. The latter are set at nearly right angles to the surface of the Sponge and extremely dense, they cause the hairy appearance of our Sponge. They are sharply pointed at either end and immersed about  $\frac{1}{5}$ - $\frac{1}{4}$  of their length in the body. They measure 2—3.5 mm. by 3.035 mm. The shorter ones are common, those measuring over 3 mm. in length found only exceptionally. The linear acerates measure 1 mm. x 0.006 mm.

*Locality*: East Coast of Australia, Port Jackson. Von Lendenfeld.

46. SPECIES. LEUCANDRA VAGINATA. Nov. spec.

Solitary cylindrical Sponges with hairy inner, but nearly smooth outer surface if compared to the nearly related *L. aspera*. Our Sponge has the shape of an irregular cone or spindle, or may even be ovate. The Osculum is always situated terminally on the narrow end of the cone. *Leucandra vaginata* attains a height of 30—40 mm. and a diameter 12—20 mm. The body wall is thick, particularly in the short and irregular specimens. The Gastral cavity measuring only  $\frac{1}{5}$ - $\frac{1}{3}$  of the diameter of the Sponge. The Osculum sometimes is surrounded by a frill. The canal system is rather complicated. The inhalent pores lead into a reticulation of tangential canals below the surface, all of which possess a circular transverse section and a diameter of 0.2 mm. The meshes of this reticulation are wide, so that no lacunes, which might be considered as subdermal cavities are formed. Towards the Gastral wall we meet with irregular circular canals running tangentially, but not regularly longitudinally. I am doubtful as to whether these form a reticulation, I think not. If anastomoses are present they are very rare. From these canals numerous small radial tubes only 0.2 mm. in diameter lead into the Gastral cavity. The terminations of these, the pores in the Gastral wall, are of the same dimensions as the canals to which they belong, and very close to one another.

*Spicules*.. The skeleton consists of similar elements as that of the foregoing species.

*Gastric Quadriradiates*. Centripetal, protruding ray  $0.1 \times 0.008$  conic, pointed, mostly straight, sometimes slightly curved near the end. Tangential ray sagittally developed. One ray situated longitudinally and pointing towards the aboral pole shorter than the other two. Angles on the side of it equal, about  $100^\circ$ . This ray measures  $0.08 \times 0.006$ . The other two equal rays  $0.12 \times 0.008$  mm.

*Triradiate and Quadriradiate spicules of the Parenchyma*. The Triradiates are equiangular with straight, conic, terminally rounded rays. The rays mostly sagittally developed. The unpaired ray longer than the other two pointing outwards and measuring  $0.28 \times 0.014$  mm. The others  $0.22 \times 0.014$  mm. Some regular Triradiates are also met with. Their rays have varying intermediate dimensions between the longer and shorter ones of the sagittal Triradiates. Some of the latter show an incipient fourth ray. Decidedly Quadriradiate spicules are rare. Their rays have the same dimensions as those of the Triradiates, but are generally curved.

*Acerate spicules*. These measure  $1.7 \times 0.035$ , are spindle-shaped and slightly curved. The concave side towards the Osculum. They are immersed in the body of the Sponge about half their length and stand nearly vertical on its surface. Both ends are sharply pointed. These spicules are not very numerous. The sheath, which covers the spicules of calcareous Sponges generally, is very highly developed on the protruding part of these spicules, much more so than in any other calcareous Sponge known to me and I have derived the specific name from this characteristic peculiarity.

*Locality*: East Coast of Australia, Port Jackson, V. Lendenfeld.

47. SPECIES. LEUCANDRA CUCUMIS. E. Haeckel (1).

This sponge is solitary and forms a cylindrical or spindle-shaped person of  $15$  to  $20 \times 7$  to  $10$ . The longitudinal axis is mostly more or less arched. Opposite the narrow peduncle there is the round Osculum of  $1.5$  to  $2$  mm., in diameter. The dermal surface

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(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 205; Band III., Tafel 33, figs. 1a-1k., Tafel 36, figs 1-3.

of the body is smooth. Gastral cavity 3 to 4 mm., in diameter, the wall of the body 2 to 3 mm., cortex 4 mm. The canals of the cortex are pretty regular and large loculi of 1 mm., in length and 0.3—0.4 mm., in width. They are like the regular radial-canals of the sycones. They communicate by conjunctif-pores, and open outward by the dermal pores, inward into the Parenchyma. The canals of the parenchyma are quite irregular, partly very narrow, partly pretty broad, and open into Gastral pores of very varying diameter.

*Skeleton* : The main skeleton consists of Quadriradiate spicules. There are 4 clearly distinct separate layers. 1. Outside a dermal layer of Triradiate spicules mixed with single Acerates. 2. A regular layer of large Quadriradiate spicules. 3. An irregular layer of middle-sized Quadriradiate spicules, and 4, a Gastral coating of Triradiates. The first layer consists of Triradiates which are mostly slightly irregular. Their rays are straight, pointed, and measure 0.15—0.25 mm. x 0.02 mm. Between them in varying quantity longitudinal, spindle-shaped Acerates are situated, measuring 0.1—1.5 mm. x 0.01—0.06 mm., these are straight or slightly curved. Below the cortex we meet with a peculiar lacunose layer, which is composed of two layers Quadriradiates. The apical ray is vertical on the plane of the three lateral rays, and is situated centripetally in the outer, and centrifugally in the inner layer. The radial rays join as in Amphorus. The inner Quadriradiates are smaller than the outer ones. Radial rays straight and pointed, lateral rays slightly curved. The rays of the Quadriradiates measure 0.6—0.9 x 0.06 mm. The central canal is often particularly well visible. Below these lies the Parenchyma, supported by irregular Quadriradiates. Their rays measure 0.1—0.6 mm. x 0.02—0.05 mm, they are mostly straight or very slightly bent. The wall of the stomach and the larger exhalent canals is coated with sagittal middle-sized Triradiates. The basal ray measures 0.1—0.4 mm., in length and is situated radially. It forms an angle of 100° with the lateral rays. These measure 0.2—0.3 mm. in length. All rays 0.02—0.03 mm. thick. The skeleton of Peristome consists of two layers, on inner one of Triradiates and an outer of Acerates.

The former are sagittal. They are similar to the Gastral Triradiates described above. The sagittal ray a little longer, the lateral rays curved. Acerates longitudinal packed closely. They measure  $0.1-3 \times 0.06-0.012$  mm.

*Locality*: Indian Ocean, Polk Straits, Ceylon, Wright; South Coast of Australia, St. Vincent Gulf, Schomburgk; Bass Straits, Wendt.

48. SPECIES. LEUCANDRA BOMBA. Haeckel (1.)

Solitary Sponge with a proboscis. Bomb shaped, consisting of a hollow sphere with a neck to it; like *Sycandra Ramsayi*. The diameter is 10-20 mm. The Sponge has no peduncle. The cylindrical proboscis, 2-6 mm. in length. Osculum circular; 2-3 mm. in diameter. The surface of the Sponge is smooth; the Parenchyma very rigid. The body wall is 3-4 mm. thick, and traversed by a large number of parietal canals, which are very short and wide. These are situated radially and branch dichotomously. Their Gastral mouths possess a diameter of 0.5-1 mm. The Gastral cavity is cylindrical or ovate, the direct continuation of the cavity in the proboscis. In the middle of the body the diameter of the stomach is equal to the thickness of the body wall. Above and below it is smaller.

*Spicules*: The skeleton consists mainly of regular Triradiates, which are larger in the Parenchyma than in the cortex. In the latter their rays measure  $0.1-0.2 \times 0.008-0.012$  mm., they are pointed, conic, straight. They are coated by dense masses of minute Acerates which form a cement (Stäbchen-Mörtel.) The component parts of this cement, the minute Acerates, are straight or slightly bent, pointed at one end and truncate at the other, which shows incipient spines. They measure  $0.02-0.04 \times 0.001$  mm. Below this layer we meet with larger Triradiates not so thickly set with minute Acerates. They are regular, their rays measure  $0.25-0.35 \times 0.02-0.025$ . The skeleton of the Parenchyma consists of middle-sized regular Triradiates, with mostly straight, conic, and pointed rays, measuring  $0.2-0.3 \times$

(1.) *E. Haeckel*. L.c. Band II., Seite 209; Band III., Tafel 33, figs. 2a-2f. Taf. 38, figs. 1-6; Tafel 40, fig. 9.

0.02—0.03 mm. The corresponding rays of adjoining Triradiates generally lie parallel. Here we find also a few very large Acerates, which are situated longitudinally and increase in number the nearer we get towards the proboscis, they are spindle-shaped, pointed at both ends, straight or curved with the convex side turned outward. They measure 7—1.5 mm. x 0.04—0.05 mm. The wall of the stomach and the larger exhalent canals is coated with regular sagittal Quadriradiates, the differentiated ray of which protrudes into the cavity. The tangential rays are sagittally developed, the sagittal ray points downwards and is 0.2—0.3 mm. long. (In the Gastral wall.) In the Quadriradiates along the canals these rays are shorter measuring 0.1—0.15 mm. only in length, and much shorter than the tangential rays, which appear strongly curved and embrace the canals. The centripetal protruding ray of the Quadriradiate is either straight or bent hook-like, and  $\frac{1}{3}$ — $\frac{1}{2}$  as long as the tangential, lateral rays. The rays of the Quadriradiates are 0.008—0.012 mm. thick.

The proboscis consists of a thick wall supported by no less than four different layers of spicules. (1st.) Outside a ring of very large longitudinal Acerates 1 x 0.05 mm. (2nd.) A layer of sagittal Triradiates the differentiated ray of which points downwards. (3rd.) A layer of similarly disposed Quadriradiates. (4th.) An interior layer of extremely slender Acerates measuring 0.6—0.9 x 0.001—0.004 which are situated longitudinally and very closely packed.

*Locality*: Pacific Ocean, Viti Islands, Graeffe; East Coast of New Zealand, Von Lendenfeld.

49. SPECIES. LEUCANDRA SACCHARATA. Haeckel (1).

LEUCANIA SACCHARATA. Ridley (2).

This Sponge occurs in the shape of solitary persons and also in colonial forms, with or without Oscula. The solitary form with

(1.) *E. Haeckel*. L.c. Band II., Seite 228; Band III., Taf. 33, figs. 3a.3e. Tafel 38, figs. 7-74.

(2.) *Stuart O. Ridley*. Report on the Sponge. Report on the Zoological Collections made in the Indian and Pacific Oceans during the Voyage of H.M.S. Alert, in 1881-1882. British Museum Catalogue for 1884, p. 482.

a naked Osculum has the shape of a cylinder or cone and is sometimes compressed leaf-shaped measuring 10—30 x 5—30 mm. It is attached by a broad basis or a rudimentary solid peduncle is developed. The Osculum at the terminal end is circular or oval and measures 3—10 mm., in diameter. Sometimes it is closed. The colonial form without Oscula appears as a large undulating mass with highly projecting gyri and often represents a "range of volcanoes" (Haeckel (1)). The largest Sponge seen by Haeckel measured 60 x 40 mm. Carter (2) was therefore wrong to say, that his *Teichonella prolifera* is "by far the largest Calcsponge on record" I have seen specimens measuring 140 x 80 x 30 mm., which were only fragments brought up by the dredge, so that the upper limit in size to which this Sponge may grow, is unknown.

*The canal system.*

The body wall is from 2 to 5 mm. thick, the Gastral cavity follows in shape the outer surface pretty regularly, but is not influenced by the external Gyri, the body wall is very much thicker 5 mm. The canal system is simple. The outer cortex is perforated by numerous small pores, which are equi-distant, and measure 0.04 mm. in diameter, the solid parts of the cortex between them are of the same dimensions as the pores. Below the pores the inhalent canals commence with trumpet shaped extensions, and lead centripetally downwards into the Parenchyma. These canals are cylindrical and situated radially, they measure 0.16 mm. in diameter and do not taper towards their centripetal termination, but end *cul-de-sac* like. No tangential inhalent canals are met with; there exists no anastomosis or sub-dermal cavities. The ciliated chambers measure 0.04 mm. across. The exhalent canal system is slightly more complicated.

Radial canals, parallel to the inhalent ones, lie between the latter and have the same shape and dimensions as these. They do

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(1.) *E. Haeckel*. Die Kalkschwämme. Eine Monographie. Band II., Seite 229.

(2.) *H. T. Carter*. On *Teichonia*, a new Family of Calcareous Sponges, with descriptions of two species. *Annals and Magazine of Natural History* 5th series. Vol. II., Nr. 7, p. 37.

not open directly into the Gastral cavity, but coalesce by means of short tangential tubes 5 to 20 of these coalesce to a very short radial tube 0.1 mm. in diameter, which opens into the Gastral cavity with a trumpet-shaped extension.

*Spicules* : The skeleton consists mainly of large Quadriradiates, to which are added minutes Acerates in the cortex and tangential Triradiates in the Gastral wall. The outer surface is covered by a smooth cortex of a brilliant white color.

The main part of it is formed of a cement of minute Acerates which are peculiar in shape. They consist of a longer conic and pointed centripetal part and springing from the distal thick end of this in an oblique direction a shorter also pointed centrifugal part, which has the shape of a triangular pyramid. From the edges of this pyramid strong spines take their origin, which are as long or longer than the spicule is thick and give the edges of the pyramid a strongly serrated appearance. These minute spicules measure 0.06 x 0.004 mm. In the cortex we meet here and there with middle-sized Triradiates and large Quadriradiates. The largest Quadriradiates are regularly disposed. Their rays are sagittally developed. Three of them extend tangentially in the outer surface, and lie in one plane, the fourth extends centripetally and is exactly radial in its position, standing vertical on the plane of the other three. This centripetal ray is 1.5 mm. long and straight. The tangential rays are 0.5—1 mm. long and curved inward at the base. All rays are 0.06—0.08 mm thick. These spicules are situated very regularly at equal distance. Below the cortex a layer of Quadriradiates is met with, the sagittal ray of which is situated centrifugally and meets the centripetal ray of the dermal Quadriradiates. Parenchyma smaller triradiates regular, with rays measuring 0.2—0.5 x 0.002—0.004 mm. Parenchymal larger triradiate spicules with rays measuring 0.6—0.8 x 4.006—0.008. Between these regular spicules a few irregular Triradiates are met with. Parenchymal Quadriradiates irregular and variable, slightly smaller than the dermal ones described above. Gastral and canal walls (exhalent) are coated by a layer of sagittal triradiates, which are situated tangentially.

The surface of the stomach and exhalent canals is consequently perfectly smooth. The lateral rays enclose an angle of  $160^\circ$  and are 0.3 mm. x 0.024, the basal sagittal ray measures only 0.37 x 0.012, mm.

Below the outer surface groups of spindle-shaped cells are met with, which are mesodermal, and which I consider as sensitive, in consequence of their great similarity to the sensitive cells of Cnidaria.

*Locality*: South Coast of Australia, Bass' Straits, Wendt. East Coast of Australia, Port Jackson, Port Denison, von Lendenfeld.

#### 7. FAMILIA TEICHONIDÆ. Poléjaeff (1.)

Heterocoela, with the outer surface differentiated into two different planes, one bearing pores the other oscula. This family is identical with that established by Carter (2) under the name Teichonellidæ. I have not seen any representatives of this family myself, but am of opinion that they might perhaps be considered as colonies of Leucones or Sycones, as Marshall (3) asserted, before Poléjaeff's essay was published. I take occasion here to draw the attention of the reader to the remark made by Carter (4), who says, concerning the Teichonidæ, established as a family by him, that "it is somewhat laughable that the self-constituted author of the History of Creation should have omitted a whole family of these Sponges" in his Monograph; knowing at the same time that the only Sponges which might be considered as representatives of the new Family Teichonidæ, were never seen or described by Haeckel or any one else before Carter, who accordingly made new species out of the existing specimens six years after Haeckel's Monograph had been

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(1.) *N. Poléjaeff*. Report on the Calcareæ. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 70.

(2.) *H. T. Carter*. On Teichania, a new Family of Calcareous Sponges, with descriptions of two species. Annals and Magazine of Natural History, ser. 5. Vol. II., Nr. 7, p. 35.

(3.) *W. Marshall*. Bericht über die wissenschaftlichen Leistungen in der Naturgeschichte der niedersten Thiere während der Jahre 1876-1879. Von Dr. Rud. Lenkart. Zweite Hälfte. Seite 714.

(4.) *H. T. Carter*. L.c., p. 38 below.

published. Every educated man in the world admires Haeckel's genius, but that his mental powers would be considered sufficient to enable him to know more than six years beforehand what new forms may be discovered, can only be accounted for by a degree of admiration which one would not expect to find in so cautious a scientist as Carter.

## 21. GENUS. TEICHONELLA. Carter (1.)

Foliate Teichonidæ. I accept this genus preliminarily, it is very doubtful whether the two species described by Carter belong to one and the same genus and in what relationship they are to the species of Teichonidæ described much more accurately by Poléjaeff as representing a new genus.

## 50. SPECIES. TEICHONELLA PROLIFERA. Carter (2).

The Sponge consists of a foliate lamina about 4 mm., in thickness which is much folded and may extend to 60 mm., and more forming a complicated folded mass. The surface of the main lamina is uneven bearing sometimes also secondary laminae of varying size. Oscula amassed on the margin of the lamina varying in diameter the largest measuring 0.54 mm. These Oscula are nearly in a line and 3 mm., apart. Oscula tubes slightly narrower than the Osculum. Inhalent pores scattered thickly, small. The Anatomy of this Sponge is unknown, so that no decision about its relationship can be arrived at.

*Spicules.* The skeleton consists of large Quadriradiates, small Quadriradiates and large and small Triradiates. Acerate spicules are absent. Triradiates regular, rays straight and pointed measuring 0.13 mm., in length in the smaller kind and 0.52 mm., in the larger. The smaller triradiate spicules are more numerous than the others. Gastral Quadriradiates with a centripetal differentiated protruding ray curved and smaller than the other three; of the same size as the smaller Triradiates. Large Quadriradiates

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(1.) *H. T. Carter.* L.c., p. 35.

(2.) *H. T. Carter.* L.c., p. 35, pl. II., figs. 7-5.

of the outer surface. Three rays tangential and regular, curved inward, fourth ray sagittal, pointing centripetally and much shorter than the others.

*Locality*: South West Coast of Australia, Freemantle, Carter.

51. SPECIES. TEICHONELLA LABYRINTHICA. Carter (1.)

Laminae smooth and wound round a central axis so as to form a labyrinth of screw-shaped fans. Oscula on the concave side of the whole lamina 0.07 mm. in diameter and 0.14 mm. apart. The lamina has a thickness of about 2 mm., the whole Sponge attaining a greatest diameter of 50 mm. The structure and position of the spicules make it apparent, that the canal system is Sycanoid.

The anatomy of this Sponge is likewise totally unknown, so that its name and position here are only preliminary.

*Spicules*: The skeleton consists of triradiate and acerate spicules. Triradiates sagittal, unpaired ray, straight 0.22 mm. long. Paired rays much shorter, curved, nearly at right angles with the unpaired ray. The long ray situated longitudinally. These spicules form a perfect tubar skeleton. Acerates straight or bent obtusely pointed at the inner, and spear-shaped at the outer end, measuring 0.13 mm. in length. These spicules are disposed in tufts, they are twice as long on the Oscular side as at the other. (To which does the measurement apply.?)

*Locality*: South west coast of Australia, Freemantle, Carter.

22. GENUS. EILHARDIA. Poléjaeff (2.)

Teichonidæ of caliciform shape. The surface carrying pores supported by triradiate and minute acerate spicules, that bearing oscula propped by large acerate spicules.

This genus is deservedly dedicated by Poléjaeff to my teacher, Franz Eilhard Schulze, the reformer of Spongology.

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(1.) *H. T. Carter*. L.c., p. 37, pl. II., figs. 6-9.

(2.) *N. Poléjaeff*. L.c., p. 70.

## 52. SPECIES. EILHARDIA SCHULZEI. Poléjaeff (1.)

The concave surface is dull, the convex has a silvery lustre. The convex surface bears low volcano-like Oscula, disposed at approximately equal distances, one from another; their diameter does not exceed 0.4 mm., usually being still less. The concave surface may be compared to a seive, its pores inconspicuous to the naked eye, are found under the microscope to be round and disposed close together; their average diameter is 0.06 mm. The wall of the calyx 3 mm. to 7 mm. thick near the centre, grows gradually thinner towards its free blade-like margin.

*Skeleton.* The skeleton of the sieve-like surface consists of sagittal Triradiate and minute Acerate spicules; that of the Parenchyma, of large regular, often sagittal Triradiate, and of minute acerate spicules; that of the convex Ocular surface of large acerate and subdermal triradiate; that of the Oscula themselves of an exterior layer of large acerate, of a middle layer of sagittal triradiate, of an inner layer of quadriradiate, and of minute acerate spicules, supporting the ring-like border of the external opening of the Osculum. The minute acerate spicules are in all parts of the body of the Sponge of the same outline.

*Minute Acerate Spicules.* Usually 0.05 mm., long, with a diameter of 0.0025 mm. *Triradiate Spicules of the Sieve-like surface.* Sagittal; all rays lying in the same plane, of the same diameter, tapering from the base to approximately sharp points; lateral rays curved forwards, slightly undulating, each forming with basal ray an angle varying from 115° to 120°, reaching 0.75 mm., in length, usually not longer than 0.5 mm., often still shorter the proportion between the length and the thickness being 15:1; basal ray straight, length inconstant, either rather exceeding that of lateral ray or equal to it, or even less.

*Triradiate Spicules of the Parenchyma.* Regular, with pronounced inclination to sagittal differentiation by the shortening of basal ray; all rays of the same diameter; the proportion between their length and thickness varying, in lateral rays, from 10:1 to

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1.) N. Poléjaeff. L.c., p. 70, pl. II., fig. 7; pl. IX., fig. 1-70.

12:1; lateral rays smooth, tapering from base to sharp points; basal ray, if not shortened, also sharp pointed, if shortened, often truncate, in both cases, however, of conical form; size extremely inconstant the length varying, in lateral rays, from 0.15 mm., to 1.8 mm.

*Sub-dermal Triradiate Spicules* showing a rudimentary fourth apical ray.

*Sub-dermal Triradiate Spicules of the convex surface.* Sagittal, all rays lying in the same plane, basal rays straight, tapering from the base to a sharp point,  $\frac{1}{2}$ - $\frac{3}{4}$ , as thick as lateral rays and either longer than these latter, not more than twice, or of the same length, or even shorter, forming with each of them an angle varying from 110° to 115°; lateral rays either straight, or slightly curved, average length 0.6 mm., the proportion between the thickness and the length varying from 1:10 to 1:12. In the space between the Oscula these triradiate spicules lie pretty regularly, their corresponding rays being disposed more or less parallel one to another, their basal ray turned to the closed end of the Sponge, and the angle between the lateral rays towards the sharp margin dividing the sieve-like surface from that bearing Oscula. Near these latter as well as near the margin just mentioned, their disposition becomes irregular, they lose their characteristic shape presenting all possible transition forms to the sagittal triradiate spicules of the sieve-like surface, and on the other hand, growing smaller and becoming similar to the rectangular Triradiate ones of the Oscular skeleton.

*Large Acerate Spicules of the convex surface* lying in several layers almost parallel to the surface, causing its smoothness and silvery lustre. From length and comparative thickness extremely variable, either spindle, club, or lance-shaped, or of quite irregular outline, reaching 1 mm. in length, usually shorter, the proportion between their length and thickness varying from 8:1 to 30:1.

*Oscular Acerate Spicules.* Spindle or lance-shaped, usually twenty-eight times as long as thick, rarely longer than 0.55 mm., often considerably shorter.

*Oscular Triradiate Spicules.* Sagittal, basal ray forming with each lateral ray an angle of  $90^\circ$ ; basal ray straight, tapering from the base to a sharp point, usually half as thick as lateral rays, often still thinner, occasionally almost of the same diameter; length inconstant, rarely more than 0.05 mm., often not exceeding 0.01 mm. or still less; lateral rays either straight or slightly curved inward, usually sharply pointed, ten times as long as thick, average length 0.01 mm.; connected as regards their form and size with the sagittal subdermal triradiate spicules of the oscular surface by a long series of intermediate stages.

*Oscular Quadriradiate Spicules.* Like the rectangular Triradiate nothing but modified sagittal triradiate spicules of the Oscular surface; lateral rays either straight or slightly curved forwards, tapering from the base to approximately sharp points, average length 0.2 mm. by 0.02 mm., basal ray usually rather shorter, straight, sharp pointed, forming with each of the lateral rays an angle of about  $110^\circ$ ; apical ray curved, not seldom undulating, sharp-pointed like the facial rays, usually rather thinner than these latter; length varying from 0.06 to 0.2 mm.

*Locality:* Station 163A, June 3, 1874, off Port Jackson; depth, 30 to 35 fathoms; rock. Station 163, April 4, 1874; latitude  $36^\circ 58' S.$ , longitude  $150^\circ 30' E.$ ; depth, 120 fathoms; off Twofold Bay, Australia, Challenger.

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## EXPLANATION OF PLATES.

### PLATES., LIX TO LXVII.

Fig. 1a.—*Ascetta procumbens*. R. v. L. Three colonies on a shell of *Mytilus*. Natural size painted from life. The middle-sponge is young and consists of only a few separate individuals. These tubes soon grow out to form a felt-like texture as seen in the other two Sponges, and leaving round, trumpet-like Pseudoscules between them. (Port Jackson, Laminarion zone.)

- Fig. 1b.—*Ascetta procumbens*. R. v. L. A colony on the inside of a *Mytilus* shell. Half the natural size. Photographed from a spirit specimen. The pseudopores small in the specimens figured in 1a attain such a size in this specimen that only narrow parts of the Sponge, consisting of one or more tubes remain between the large pores. In this way the whole attains the shape of a beautiful network. (Port Jackson, 10-15 fathoms.)
- Fig. 1c.—*Ascetta procumbens*. R. v. L. A colony half the natural size. Photographed from a spirit specimen. The reticulation extending in a single plane only in the specimen figured in 1b extends into the third dimension and so a spongy structure is produced. Attached to the sea bottom. (Off Port Jackson, 30-40 fathoms.)
- Fig. 1d.—*Ascetta procumbens*. R. v. L. A specimen similar to 1c, with finer pores and different shape, growing all over the fragment of a coral.
- Fig. 2.—*Ascetta procumbens*. R. v. L. Transverse section through a narrow part of the Sponge figured in 1a to the right below. Osmic acid Picrocarmin. The inhalent pores (*P*) appear in the entirety, among Ascones, unprecedented shape of very long and narrow canals, leading from the outer surface into the gastral cavity. The tubes are cylindrical. The outer surface is smooth, only the tips of the rays of a few irregularly disposed spicules protrude from it. The inner surface is extremely uneven and covered with ridges. In the thick Mesoderm numerous ova (*E*) are visible. A., Oc. III.
- Fig. 3.—*Ascetta procumbens*. R. v. L. Transverse section through part of a tube. Osmic acid, Picrocarmin. The section passes through one of the ridges (*l*) in the gastral wall and discloses a spicule and an inhalent canal to view. The outer surface (*a*) and the inhalent canals (*g*) are covered by a low ectodermal Epithelium, which covers also several of the protruding tops of the spicules (*b*). The thick Mesoderm contains no bipolar muscular or tissue-cells. The transparent gallert is filled by numerous multipolar tissue-cells, the processes of which are irregularly disposed (*s*). A young ovum (*E*) appears in the section. Amœboid wandering cells are absent. Around the spicule (*f*) the Mesoderm cells form an Endothel which covers the immersed part of it. The spicules are covered by a highly colourable cuticle and show the axial canals very clearly. The flagellate frill cells cover the whole of the inner surface of the gastral cavity. F. Oc. II.

Fig. 4.—*Ascetta procumbens*. R. v. L. An adult spicule. The rays are conic and rounded. In other species they do not have this shape. F. Oc. II.

Fig. 5.—*Ascetta procumbens*. R. v. L. A young spicule. The rays of which are already so thick as those of the adult, only much shorter. F. Oc. II.

Fig. 6.—*Ascetta procumbens*. R. v. L. Schematic view of the interior of the gastral cavity showing the reticulation of the ridges.

Fig. 7.—*Ascetta Macleayi*. R. v. L. Painted from life. AA. Oc. II.

Fig. 8.—*Ascetta Macleayi*. R. v. L. Transverse section through the upper part of a colony. Osmic acid, Alumn Carmin, AA. Oc. II. The black dots represent the flagellate cells. In this portion the Sponge represents a tube of large diameter, a pseudosculum in the wall of which small lacunae Ascon individuals or ciliated chambers make their appearance.

Fig. 9.—*Ascetta Macleayi*. R. v. L. Transverse section through a colony in its thickest part. Osmic acid, Alumn Carmin, AA. Oc. II. The dots represent the flagellate cells. The Ascon tubes in this region of the Sponge are not connected by a membrane as above.

Fig. 10.—*Ascetta Macleayi*. R. v. L. Transverse section through the solid peduncle. Osmic acid, Alumn Carmin, AA. Oc. I.

Figs. 8, 9 and 10 are selected from a continuous series of sections made through one specimen.

Fig. 11.—*Ascetta Macleayi*. R. v. L. Longitudinal section through the colony. Osmic acid, AA. Oc. I. The Pseudosculum (*O*) is formed by a simple membrane above. Further down Ascon tubes are found around it. The tube terminates as such below, just above the middle of the Sponge. The central and lower part form a free reticulation (*s*) here the Ascon-persons are not connected by a membrane. (See fig. 9.) Towards the peduncle the Ascon tubes become larger. The solid peduncle (*p*) extends below to form a disc, by means of which it is attached.

Fig. 12.—*Ascetta Macleayi*. R. v. L. Transverse section through a tube. Osmic acid, Alumn Carmin, F. Oc. II. This section is near the top of the Sponge, where the Ascon tubes are joined by a membrane

(*m*), this contains the ordinary triradiate spicules disposed exactly tangentially. It is formed by Mesoderm—a thin wall with sparsely scattered tissue cells—and a coating of flat ectodermal pavement cells on either side. The surface *a c b* forms part of the *outer* surface of the Sponge, *d e f* on the other hand is part of the surface of the pseudosculum. The pores in the outer surface (*p*) are of course inhalent, they are small, those of the inner surface are not so numerous and much larger (*P*) they are exhalent. The pseudoscular tube very flexible, and following every current of water acts like a moveable chimney, and evidently greatly assists the flagellate cells in producing a strong current of water through the Sponge. If we consider the Pseudoscular tube as a *real* gastral cavity and the Ascon tubes as ciliated chambers, we have an ordinary Leuconide or Syllcibide Sponge before us. Inhalent (*p*) and exhalent (*P*) canals are clothed with low epithelium. The inner surface of the tube (*g h*) is covered by the ordinary flagellate cells. The spicules, regular Triradiates have the shape of low pyramids following absolutely tangentially the curvature of the Ascon tubes. Their points never protrude.

Fig. 13.—*Ascetta Macleayi*. R. v. L. Transverse section through the solid peduncle. Osmic acid, Alumn Carmin, DD. Oc. I. In the tubes and pseudoscular wall we find only a single layer of spicules. In the peduncle we meet with a strong cote of three to five layers of spicules with numerous multipolar tissue cells in the mesoderm. The central part is destitute of spicules and filled with numerous highly colourable cells (*a*) which appear spherical in the specimens treated with hardening reagents. They may be amorboïd cells; it appears not unlikely that they are young stages of ova or spermatophores. In which case the peduncle must be considered as a kind of sexual organ or brooding place. (Similar to the formation of ova in the hollow peduncle of *Homoderma* and the *Hydrorhiza* of some sessil *Hydromedusæ*.)

Fig. 14.—*Homoderma Sycandra*. R. v. L. Growing from an *Aplysilla violacea*, painted from life in natural size.

Fig. 15.—*Homoderma Sycandra*. R. v. L. Longitudinal section combined picture. The same kind of Entodermal flagellate cells throughout the Sponge and the *Spongorhiza*. Ciliated tubes as in *Syconidæ*. *Spongorhiza* hairy. These ummits of the ciliated tubes crowned by tufts of *Acerates*. Regular disposition

of the ciliated tubes. Numerous young ova, particularly in the particularly in the Mesoderm of the peduncle. Two oscular frills of *Acerates*.

Figs. 16-21.—*Homoderma Sycandra*. R. v. L. The Metamorphosis from the simple sackshaped Ascon to the adult, but small *Sycon*.

Figs. 22-23.—*Homoderma Sycandra*. R. v. L. *Acerate* spicules of the tufts on the ciliated tubes.

Figs. 24-26.—*Homoderma Sycandra*. R. v. L. *Quadriradiate* spicules of the *Parenchyma*.

Figs. 27-29.—*Homoderma Sycandra*. R. v. L. *Triradiate* spicules of the *Parenchyma*.

Figs. 30-31.—*Homoderma Sycandra*. R. v. L. *Quadriradiate* spicules of the gastral wall.

Fig. 32.—*Homoderma Sycandra*. R. v. L. Transverse section through the middle of *Sponge* individual. Combined picture.

Fig. 33.—*Homoderma Sycandra*. R. v. L. Transverse section through half the upper part of the *Sponge* *Osmic Acid*. *Picrocarmin*, F. Oc. II. This section shows the distribution of the different spicules. In the *Mesoderm* there is a large oval *Ovum*. The spicules are covered by sheaths, particularly those which protrude into the *Gastral cavity* show these sheaths very clearly. *Protruding triradiates* of the regular kind of fig. 27, are exposed in the section. These are rare hidden by the tufts of *acerates*, which are parallel to one another, and immersed only a very short distance.

Fig. 34.—*Leucopsis pedunculata*. R. v. L. *Longitudinal section*. *Osmic Acid*, the dots represent the *flagellate cells* covering the inner surface of the *Ascon tubes* which have become in this species *isolated ciliated chambers*, with one large *exhalent pore* to each. The shape of these chambers is *irregular*.

Figs. 35, 36.—*Sycandra Ramsayi*. R. v. L. Seen en face (35) and en profile (36.) Photographed from a spirit specimen.

Fig. 37.—*Sycandra Ramsayi*. R. v. L. *Transverse section* combined picture. C. Oc. I. The *inter or inhalent canals* are particularly wide, and both these and the *ciliated tubes* remarkable for their *regularity and straightness*. The tufts of spicules are disposed *tangentially* on the summits of the ciliated tubes.

- Fig. 38.—*a* and *b*. *Sycandra Ramsayi*. R. v. L. Triradiate sagittal spicules of the Parenchyma (*a*) which often show an incipient fourth ray (*b*.)
- Fig. 39.—*a* and *b*. *Sycandra Ramsayi*. R. v. L. Quadriradiate spicules, *a* of the Gastral part of the Parenchyma, *b* of the Gastral wall. The sagittal ray of the former lies centrifugally, that of the latter centripetally.
- Fig. 40.—*a b* and *c*. *Sycandra Ramsayi*. R. v. L. Acerate spicules of the dermal tufts *a* large straight spindle-shaped acerate, *b* and *c* irregular curved spicules numerous at the base of the tufts.
- Fig. 41.—*Grantessa sacca*. R. v. L. Photographed from a spirit specimen.
- Fig. 42.—*Grantessa sacca*. R. v. L. Transverse section, through *a* one of the tufts of spicules conspicuous in fig. 41.
- Fig. 43.—*Leucandra meandrina*. R. v. L. Transverse section. The dermal cortex *a* is penetrated by the pores which open into tangential canals *b*, from which centripetal inhalent tubes *c* take their origin. The exhalent centripetal canals *d* lead into tangential wide and lacunose canals *e* with mostly an oval transverse section, which finally open into others *f*, just below the Gastral wall. These are in connection with the Gastral *g* by irregular pores *P*.
- Fig. 44.—*Leucandra meandrino*. R. v. L. A Gastral quadriradiate spicule.
- Fig. 45. *Leucandra meandrina*. R. v. L. *a* Parenchymal triradiate spicule.
- Figs. 46, 47.—*Leucandra saccharata*, Haeckel. Photographed from spirit specimens.